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Macroprudential Regulation in Finnish Housing Markets:
Lessons from Literature

Master's Thesis

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Abstract

I review the literature on the novel system-wide stability oriented approach to financial regulation called macroprudential policy that has gained wide popularity after the recent global financial crisis. The aim is to shed light on the new policy by reviewing the existing research on the matter as well as identifying the gaps in the current knowledge. In comparison with other policy fields in the broader financial regulation context, macroprudential policy is still in its infancy, and no consensus on the suitable policy regime has been reached so far. Moreover, evidence, say, on the effects of the macroprudential instruments employed remains limited at best, and policymakers have essentially formulated their toolkits by the process of trial and error.

Next, I go on to focus especially on macroprudential policy conducted in the housing market, a sector that also was in the center of events in the recent financial crisis. Several characteristic features of the housing market are such that it is prone to threatening the stability of the financial system as a whole. These properties include the importance of dwellings as a storage of wealth for households and generally high leverage in house purchases. Due to the central role of the sector, policymakers have attempted to contain housing market disturbances, among other measures, by imposing limits on maximum allowed loan-to-value ratio in mortgages.

I then progress further by drawing lessons from these literatures to the macroprudential policymakers operating in the Finnish housing market, providing development suggestions for regulatory framework in place. Despite the recent introduction of several new tools in Finland, there is still room for improvement. I propose complementing the existing toolkit with debt-service-to-income limits in mortgage lending and adopting a dynamic loan loss provisioning scheme. Both of these appear prominent solutions in the light of international experience, and the introduction of the tools is also supported by the special features of the Finnish housing market. Furthermore, a task that calls for attention in particular in Finland and other EU countries due to the single market rules is further strengthening the international coordination between authorities.

Keywords macroprudential, housing markets, Finland

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Tiivistelmä

Laadin kirjallisuuskatsauksen makrovakaussääntelystä, joka on taannoisen maailmanlaajuisen finanssikriisin jälkeen laajan suosion saavuttanut järjestelmävakausorientoitunut rahoitusalan sääntelypolitiikan lähestymistapa. Tavoitteena on valottaa tätä uutta lähestymistapaa käymällä läpi olemassa olevaa tutkimusta aiheesta tunnistaen samalla aukkoja nykytietämyksessä. Muuhun rahoitusalan sääntelyyn verrattuna makrovakauspolitiikka on yhä lapsenkengissä, eikä yksimielisyyttä sopivasta politiikkahallintojärjestelmästä ole tähän mennessä saavutettu. Lisäksi näyttö esimerkiksi käytettyjen makrovakaustyökalujen vaikutuksista on yhä parhaimmillaankin rajallista, ja päättäjät ovatkin laatineet välineistön pääasiallisesti yrityksen ja erehdyksen kautta.

Seuraavaksi keskityn työssä erityisesti asuntomarkkinoilla harjoitettuun makrovakaussääntelyyn. Asuntomarkkinat olivat myös taannoisen finanssikriisin tapahtumien keskiössä, minkä lisäksi ne ovat ominaispiirteiltään alttiita uhkaamaan koko rahoitusjärjestelmän vakautta: kotitalouksien varallisuus keskittyy asuntoihin, ja asuntokauppojen velka-aste on yleisesti korkea. Sektorin keskeisen aseman vuoksi päättäjät ovat yrittäneet hillitä asuntomarkkinoiden häiriöitä muun muassa asettamalla rajoituksia asuntolainojen enimmäisluototusasteelle.

Etenen ammentamalla kirjallisuudesta kehitysehdotuksia Suomen makrovakauspäättäjille tämänhetkiseen sääntelykehikkoon. Huolimatta hiljattain käyttöönotetuista uusista sääntelytyökaluista parantamisen varaa on yhä. Ehdotankin nykyisen välineistön täydentämistä asuntoluotonannon enimmäisvelanhoito-rasitussääntelyllä sekä dynaamisella luottotappiovarausjärjestelmällä. Kansainvälisen kokemuksen perusteella molemmat vaikuttavat lupaavilta ratkaisuilta, ja näiden uusien työkalujen käyttöönoton puolesta puhuvat myös suomalaisasuntomarkkinoiden erityispiirteet. Lisäksi kansainvälisen viranomaisyhteistyön vahvistaminen edelleen on erityisesti Suomessa ja muissa EU-maissa yhtenäismarkkinasääntöjen vuoksi keskeistä.

Avainsanat makrovakaus, asuntomarkkinat, Suomi

CONTENTS

GLOSSARY OF ABBREVIATIONS

BaFin…...…….Federal Supervisory Authority

BIS…...…….……Bank for International Settlements

BoE…...…….…....Bank of England

BoF…...…….…….Bank of Finland

CCP…….……..central counterparty

BCBS……Basel Committee for Banking Supervision

DSGE…….……dynamic stochastic general equilibrium

DTI……...debt-to-income

DSTI…….…….……..debt-service-to-income

ESRB…….……European Systemic Risk Board

FDIC……...Federal Deposit Insurance Corporation

FIN-FSA……...Finnish Financial Supervisory Authority

FMSA……Federal Agency for Financial Market Stabilisation

FSOC……..…...Financial Stability Oversight Council

GDP……..…...gross domestic product

G-FSC……..……...German Financial Stability Committee

IMF…….International Monetary Fund

IRBA……...…….Internal Ratings Based Approach

LTV…….loan-to-value

SIR……..……single integrated regulator

SSM……..……..Single Supervisory Mechanism

SRM……..…..……..Single Resolution Mechanism

1. INTRODUCTION

The recent global financial crisis with its devastating consequences ignited an important discussion on the sufficiency of the framework in place for financial sector regulation. A clear consensus seems to be emerging in the literature on the need for a reform concerning the regulatory practices. Moreover, there is a wide agreement on the central reason for the reform, too: the pre-2007 practices were deficient due to their microprudential nature (Hanson et al. 2011). Now, in the aftermath of the crisis, both policymakers and academics appear to be rather unanimously suggesting that a macroprudential approach should be adopted instead (Galati and Moessner 2014). Put simply, this would translate into a shift of focus from the health of individual financial institutions to the stability of the system as a whole.

Of course, the fact that a crisis occurred did not automatically justify a holistic alteration of the existing regulatory framework but it was the underlying reasons that most obviously did. Indeed, several market failures calling for correction are thought to have significantly contributed to the build-up of the global financial instability witnessed in the late 2000s. For instance, both implicit and explicit safety nets for financial institutions whose failure was deemed a potential threat to the entire system gave them the incentives for excessive risk taking, just to name one example of the many distortive mechanisms at play. These distortions led to aggregate risk increasing considerably above the socially optimal level, which warrants corrective policy intervention. (Bank of England, henceforth BoE, 2009)

Furthermore, unlike some crises before, the recent one had special features that caused particularly severe damage to the real economy in many countries. As Duca et al. (2010) argue, for example the 1987 stock market crash was of very different nature compared to the events between 2007 and 2009. While the overheating in the late 1980s concerned in large part only the financial sector, during the recent crisis, especially in the United States (US), a house price bubble inflated, as well, mainly because the subprime mortgage lending and the associated securitization of the loans was allowed. Hence, undoubtedly, housing markets were at the center of the developments leading to the crisis, and the resulting foreclosure wave serves well to illustrate the real-sector consequences.

But although it is now, with the benefit of hindsight, easy to point out the numerous flaws in the financial sector regulation in place prior to 2007, the remedy is not as clear-cut. Despite the agreement on the need to move towards a macroprudential approach, there is no

consensus on the set of suitable policy tools or institutional arrangements for the purpose. Moreover, even though much effort has been undertaken in the last few years to study the effectiveness of the policy approach, the field is undeniably still in its infancy and rather little is known about the effects of the policy instruments at disposal. Several issues in the implementation of the macroprudential approach are also recognized, requiring solving before the novel regulatory practice can reach its full potential. (Galati and Moessner 2014)

Given the importance of housing markets for the recent financial crisis, it is understandable that a significant proportion of all the research efforts on macroprudential policy has concentrated particularly on housing market regulation (Eerola 2016b). And, in fact, historical country experience from previous decades suggests that it was not a one-time phenomenon either that a house price boom played a key role in financial crisis build-up (Crowe et al. 2013). Therefore, the attention the real-estate sector has gained appears justified, as do the many regulatory improvements proposed in the literature for preventing the history from repeating itself. In the global context, these suggested improvements come in many shapes and sizes, perhaps the most notable examples being limiting household indebtedness and developing the loan loss provisioning practices of the banks.

As in many other countries, in Finland, too, the real-estate sector is viewed as a vital factor for overall financial stability (Putkuri 2016). In spite of the fact that the Finnish economy did not experience as deep issues in the housing market as, say, the US did at the end of the preceding decade, Finland has suffered a similar boom-bust period of its own some 25 years ago. At the time, the burst of the real-estate bubble contributed to a nationwide banking crisis followed by the deepest recession in any industrialized country since the 1930s (Gorodnichenko et al. 2012). While the banking crisis is now in the past, three principal properties suggest that the Finnish financial system has retained its vulnerability to issues in housing markets. As Putkuri (2016) argues, first, debt-financed owner-occupancy is a typical form of living for Finns, second, dwellings constitute even by international comparison an important storage of wealth for households and, third, the banking sector is highly concentrated.

Recently, the authorities in Finland have introduced multiple new macroprudential instruments, such as a limit on maximum allowed mortgage relative to the house value, to mitigate the vulnerabilities in housing markets, but there is scope for further improving the toolkit. For instance, the possible limitations in the instruments currently at disposal could

be addressed by complementing the toolkit in use with a cap on maximum allowed total debt service expenses relative to household income level.

This paper is motivated by two main goals related to what is set out above. First of all, the aim is to familiarize the reader with the elements of the macroprudential approach to financial regulation from a general perspective and in somewhat more detail to regulation in housing markets. Secondly, in the light of the reviewed collective experience and knowledge on macroprudential policymaking, the objective is to discuss the state of Finnish housing market regulation and propose some development suggestions, too. An arguably important issue that, in turn, is largely outside the scope of this review is the cost considerations related to regulation. Nonetheless, the analysis should guide further research on the subject by alleviating identifying policy-relevant research questions and, particularly in Finland, potentially inform policy decisions directly.

Structured around these goals, the remainder of the paper is organized as follows. Chapter 2 outlines the macroprudential policy framework, including background of the approach, central goals, proposed policy tools, institutional arrangements and effectiveness analysis. Chapter 3, in turn, focuses on the special features of housing markets for financial stability and relevant policy instruments for the sector. Chapter 4 then goes on to deepen the analysis by focusing solely on the Finnish housing market regulation from the macroprudential perspective, providing an overview of the housing market in Finland followed by the improvement propositions. With the purpose of synthesizing the preceding discussion, the last chapter concludes.

2. MACROPRUDENTIAL POLICY FRAMEWORK

2.1 Background of Macroprudential Approach

The origins of the term macroprudential can be traced all the way back to the 1970s, but the popularity that nowadays characterizes the word is, in fact, a rather novel phenomenon. Although the concept of macroprudential was employed at earliest almost a half a century ago in the Bank for International Settlements (BIS) records, its use was nearly non-existent in the decades preceding the recent global financial crisis. By contrast, after 2007 the term

macroprudential has gained almost buzzword-like popularity in the financial sector regulation related discourse.

Over the years, naturally, the specific meaning of the term has evolved along with the society, but nowadays there is an established way to define it. The literature standard is to contrast macroprudential to its antonym microprudential. Applying this widely-employed definition, macroprudential refers to the use of policy instruments specifically intended to support the stability of the financial system as a whole, or for brevity, financial stability, as opposed to the alternative to focus on individual institutions. This definition is also the one that is employed for the purposes of this paper. (Clement 2010)

Regarding financial stability, as Heikensten (2004) puts it, "the concept (…) is slightly vague and difficult to define." Allen and Wood (2006) provide a comprehensive discussion on the term, arguing for a definition that, among other properties, relates the state of affairs clearly to welfare, so that it is sensible for public policy to pursue it. One interpretation satisfying this condition is provided by Mishkin (1991), who defines financial stability as the capability of the system to allocate savings efficiently to investment opportunities in a lasting manner and without major disruptions. Yet, while this definition has its benefits, requirement of efficient allocation is highly demanding, and there are many examples of systems that were arguably less than efficient but stable nonetheless, such as the Soviet Union until its very last years (Allen and Wood 2006). Therefore, Allen and Wood (2006) speak for an alternative approach, followed here, too, and define financial stability as a state without signs of financial instability. These signs include inability of large number of parties, such as households, to get the means of paying their bills on any terms and macroeconomic indicators like aggregate consumption falling sharply.

As for the distinction between macroprudential and microprudential approaches, in turn, several fundamental differences exist. Borio (2009) highlights that the key difference between the two approaches is their treatment of risk. While, from a macroprudential point of view, risk is endogenous since the institutions collectively can affect asset prices as well as liquidity, the microprudential manner to model risk is to take it as exogenous due to lack of impact individual institutions typically have on the market. Or as Hanson et al. (2011, p. 3) put it more formally, in microprudential approach, "regulation is partial equilibrium in its conception" whereas a macroprudential manner is to recognize "the importance of general equilibrium effects". Moreover, from the macroprudential perspective, the failures of single institutions are not a problem as long as they do not threaten the entire system, the focus

being on the welfare of the entire society instead of consumer protection, which, in turn, is the case with microprudential policy. Table 1 summarizes the comparison of the two approaches.

Table 1: Macroprudential Versus Microprudential Approach (source: Borio 2003, p. 2)

	Macroprudential	**Microprudential**
Proximate objective	limit financial system-wide distress	limit distress of individual institutions
Ultimate objective	avoid output (GDP) costs	consumer (investor/depositor) protection
Model of risk	(in part) endogenous	exogenous
Correlations and common exposures across institutions	important	irrelevant
Calibration of prudential controls	in terms of system-wide distress; top-down	in terms of risks of individual institutions; bottom-up

Hanson et al. (2011) explain the difference between the two in practice by an example, in which the risk of bank failure is moderated by requiring a certain percentage of its assets to be capital. Now, if the bank experiences losses and its capital falls by some amount, it can either raise fresh capital from the market or simply shrink its asset base to keep the leverage ratio at a tolerated level. A key difference in microprudential and macroprudential approaches can be illustrated by the stance the regulator takes on this choice. While a microprudential regulator is indifferent to whether the bank raises new capital or shrinks its asset base to comply with the rules, a macroprudential regulator would likely have an opinion on the preferred option. From a microprudential point of view, it makes perfect sense that the perhaps weaker bank is allowed to decrease its assets by, say, cutting back on lending after experiencing losses, leaving room for its healthier competitors to take over the market share. However, a macroprudential regulator, concentrating on the system as a whole, has to see the bigger picture and notice that if a large fraction of the banks behaves this way, the generalized asset shrinkage may have disastrous consequences.

The adverse effects of generalized asset shrinkage are twofold. First of all, operating firms may not have sufficient line of credit if banks cut back on lending on a large scale, reducing investment and increasing unemployment. Second of all, the fire-sale effects may drive asset prices down sharply if banks shrink their asset base by selling securities. Hanson et al. (2011) go on to point out that the two consequences of asset base shrinkage, the so-called credit crunch and fire sales, are also closely connected, as argued in Diamond and Rajan (2011). If banks collectively decide to sell, for example, mortgage securities to comply with the

regulation, the fire-sale effects may cause the price to fall to a point where the security offers 20 percent rate of return. In this case, the rate on new loans has a tendency to go up to 20 percent, too, since an intermediary can either make new loans or buy the securities at the fire-sale price, so the returns of the two should be equal. Hence, the fire sales further deepen credit crunches in market equilibrium.

Due to the arguably limited view the microprudential approach offers to financial regulation, it is nowadays deemed widely insufficient as such. A somewhat unanimous consensus has emerged among academics and policymakers that the regulatory framework in place before the recent financial crisis was flawed particularly because it was mainly focused on the microprudential perspective. To address the issues in the deficient past framework, a transition to clearly more macroprudential financial regulation is needed. (Hanson et al. 2011)

2.2 Central Goals

In extremely general terms, the objective of macroprudential policy is improving financial stability by mitigating systemic risk (Lim et al. 2011), which then ultimately allows for steady economic growth. However, there is still room for discussion in the literature on what the concept of systemic risk exactly covers. Consequently, unlike with monetary policy, the key objective of which typically being controlling inflation, there is no consensus on the specific aims of macroprudential policy. For instance, whereas the European Central Bank (ECB) is able to set price stability as its goal and clearly define it as "a year-on-year increase in the Harmonised Index of Consumer Price (HICP) for the euro area of below 2%" (ECB 2001, p. 38), macroprudential policymakers do not have such privilege (Galati and Moessner 2013). Instead, two broad dimensions of systemic risk, the cross-sectional dimension and the time dimension, are typically considered and attempted to address (Borio 2003).

2.2.1 Addressing Issues Related to Common Exposures and Interlinkages

At the heart of the cross-sectional dimension of systemic risk are common exposures of financial institutions and interlinkages in the system at a point in time (Borio 2011). These characteristics of the financial system expose it to certain forms of shocks. Caruana (2010) lists two main types of scenarios that may lead to system-wide issues, one relating to

common exposures and the other to interlinkages. Avoiding these sort of scenarios is what macroprudential policymakers aim at when addressing the problems related to the cross-sectional dimension of systemic risk.

Firstly, a shock can present a systemic threat due to direct common exposures, which has historically proven to be the case with housing market downturns, for example. If large enough proportion of the aggregate balance sheet of the system is exposed to a risk that materializes if the real estate markets face problems, the stability of the system as a whole would be threatened particularly due to the fire-sale effects. This is true even though, from a microprudential point of view, each institution would seem healthy when inspected in insolation of the others, being unable to affect market prices. The underlying problem is that because of the fire-sale effects, any bank increasing its leverage ratio imposes a negative externality on other banks they share common assets with. This is due to the fact that in a crisis state the liquidation value of these assets falls sharply if the banks simultaneously decide to sell them, as illustrated by the example in Hanson et al. (2011) described previously. And as the banks do not take this externality into account, the aggregate risk increases to a socially excessive level in the absence of regulation because of the common exposures.

Secondly, the financial system being a highly complex network of interconnected balance sheets, even in the absence of direct common exposures, a shock faced by a single ill-prepared institution may spread through interlinkages to connected institutions that otherwise are sound and trigger a domino effect. This phenomenon termed contagion can take many forms but one key contagion channel is through direct counterparty exposures (Gai and Kapadia 2010); if one financial firm fails, the firms that have receivables from it may in the worst case fail, too, being unable to collect what is theirs form the insolvent firm (Jorion and Zhang 2009).

A contagion risk was feared to materialize in the infamous Continental Illinois crisis in the early 1980s, and the term too big to fail was popularized in reference to the crisis (Gorton and Tallman 2016). The concept of being too big to fail is used to describe an institution that is deemed too important to the system to become insolvent. The fact that the failure of certain important institutions could lead to system-wide distress causes an issue of its own, namely, moral hazard. As financial institutions know that they are deemed too big to fail by policymakers, they can rely on the authorities to come to rescue in case they are in danger of becoming insolvent. Now, this gives them the incentives for both increasing their size

further to retain the status of being too big to fail as well as taking excessive risks since the potential losses from their activities would not be fully theirs to carry. (Strahan 2013) Therefore, in the wake of the recent financial crisis, one of the central goals for macroprudential policy is to limit, or if possible, eliminate this type of moral hazard issues[1].

2.2.2 Dampening Procyclicality

In addition to addressing issues related to the cross-sectional dimension, in a sense somewhat separate goal of macroprudential policy is to dampen procyclicality, to deal with the time dimension of systemic risk. (Borio 2011) The time dimension has to do with the fact that, by nature, the financial system tends to generate booms, which are then followed by disastrous busts. These periods of time are characterized by excessive financial innovation, and the new products have proven to be difficult to understand and hence to price correctly. Credit growth is typically rapid, too, which itself contributes to the soaring asset prices. In other words, the system is prone to endogenously generating systemic risk by amplifying the scope of fluctuations in the economy and this process is attempted to contain by macroprudential policy concentrating on the time dimension of systemic risk. (Caruana 2010)

Although there is wide agreement in the literature on the importance of macroprudential policy in dampening procyclicality in general, some controversial issues still remain in the details. In particular, there is no consensus on whether macroprudential policy should directly pursue limiting asset price bubbles, despite their widely acknowledged harmfulness. (Galati and Moessner 2013) While, for example, Landau (2009a) argues that macroprudential policy should aim at preventing bubbles, some others, such as BoE (2011), suggest that at least certain types of bubbles may not be relevant from the macroprudential point of view.

One of the arguments in favor of avoiding asset price bubbles *per se* as a part of macroprudential policy is the fact that, in such conditions, asset prices can deviate

[1] It is important to make the distinction to the moral hazard discussed here and a similar issue with incentives often pointed out in the microprudential context caused by deposit insurance. While deposit insurance has the merit of preventing bank runs (Diamond and Dybvig 1983), it at the same time distorts the incentives of banks by leaving the possible losses to the society and letting the banks still enjoy their profits fully. Hence, as a solution, putting in place capital regulation is suggested to make banks internalize the externality. However, as discussed above when comparing microprudential and macroprudential approaches, the traditional capital regulation is not sufficient and several issues remain even though the deposit insurance system is accounted for. (Hanson et al. 2011)

significantly from their fundamental value, creating distortions in resource allocation (Landau 2009b). This was also the case with the housing price bubble in the recent financial crisis in the US (Duca et. al 2010). The underlying problem was an asymmetry in incentives between the highly leveraged investors and their lenders. Indeed, as Landau (2009b) highlights, these investors had a strong incentive to disregard the true downside tail risk, which was generally also underestimated both due to incomplete financial risk measurement and accounting methodologies that created a disconnection in time between return and risk assessment. Moreover, despite the ongoing efforts, this type of problem is deemed difficult to completely prevent *ex ante* (Landau 2009a). Thus, macroprudential supervision is thought to be called for to prevent bubbles from building up as they are detected.

The advocates of leaving directly moderating asset prices outside the mandate for macroprudential policy, in turn, note that not all bubbles are financed by credit and thus may not be a problem for the financial system as a whole, in spite of their arguably large wealth and aggregate demand impact. An example of such crisis is the so-called dotcom bubble in the early 2000s. During the time the bubble was inflating, the rise in technology share prices was mainly not financed by bank credit, so the development also unwound without severely harming the banking system. Therefore, it can be argued that reacting to mere overexuberance among equity investors should not be an objective for macroprudential policy, and conventional macroprudential tools might also potentially be ineffective for addressing problems like these. (BoE 2011)

Contributing to the discussion on whether asset price moderation should be a goal for macroprudential policy, Kannan et al. (2012) study the special case of housing price booms using a dynamic stochastic general equilibrium (DSGE) model. The central finding in this work is that it is crucial to see behind the reasons for the soaring housing prices before taking action. In particular, the results suggest that while it would provide stabilization benefits to dampen credit market cycles when an economy faces financial sector or housing demand shocks, the optimal macroprudential rule under productivity shocks is to not intervene. Even though this finding may not boast huge external validity, perhaps some general lessons can be learned: it appears that better understanding of the phenomenon by policymakers would yield more effective and less distorting outcomes.

2.3 Policy Toolkit Design Considerations

While much has been learned about the systemic risk from the recent financial crisis, as Caruana (2010) points out, translating these insights into practical policies is not a simple task, and many fundamental issues need to be considered before beginning to formulate solutions. For instance, the policy measures can be imposed on all sectors or targeted specifically at certain ones deemed risky. In addition, the policies can be triggered automatically by a set of rules or, alternatively, discretion can be left for the authorities to apply the rules when considered appropriate.

One of the most relevant issues in policy design is whether to employ broad-based or targeted tools. Both extremities, broad-based and highly targeted instruments, have their own pros and cons, but in practice, combining both approaches in the macroprudential toolkit is the typical choice (Borio 2011). The principal advantage of the aggregate approach is that it leaves less room for regulatory arbitrage and hence, as BoE (2011) argues, broad-based instruments are less prone to merely shifting the risk from one sector to another. In addition, the approach does not require so granular data as the more targeted tools do and limits the complexity of the regulation, lowering administration costs. (Lim et al. 2011) However, at the same time, if targeting can be implemented properly, the regulatory burden is only imposed on the sectors where the problems lie, so the targeted instruments, too, have their merits.

Another important consideration macroprudential policymakers face is whether to design the tools so that triggering the policies is rules-based or some degree of discretion is left for the authorities. For instance, imposing capital requirements for banks is a policy tool, the use of which would strictly be triggered by a rule: if a certain leverage ratio is exceeded, banks must either raise fresh capital or decrease their asset base to comply with the regulation. In practice, however, as IMF (2011a) points out, all policymaking involves some degree of discretion by the authorities. In the example above the discretionary part would be determining the capital required in the first place. It is thus more realistic to view the rules versus discretion property of the instruments as a continuum rather than a binary feature.

The strengths of mainly non-discretionary measures include, but are not limited to, requiring no justification or further decisions from the policymakers at the implementation phase. This alleviates both the communication to the public related to the use of the macroprudential

tools and the political pressure for inaction the authorities feel especially in booms. Indeed, the risk of political paralysis is obvious. In the context of the cross-sectional dimension, it may be difficult to act without being accused of not keeping the playing field level for different institutions. Furthermore, from the time dimension point of view, it has proven to be extremely difficult to avoid the temptation to keep enjoying the apparently endless boom, a manifestation of the problem commonly known in the literature as regulatory forbearance. In both of these cases, clear, pre-determined rules can help by tying the hands of the authorities *ex ante*. (Borio 2011)

On the other hand, leaving significant discretion in the use of the macroprudential tools to the authorities has its advantages, as well. For example, if the economic environment is changing quickly, it might be difficult to develop and put to use suitable rules-based policy tools at the required pace. (Lim et al. 2011) In addition, as Borio (2011) argues, rules are by nature prone to circumvention as the financial firms innovate, but when the authorities retain discretion, the policy instruments are harder to arbitrage away.

2.4 Different Policy Tools

Since there is no single agreed-upon way to design macroprudential policy, it is no surprise that the different policy instruments proposed are numerous and form a complex overall toolkit. Determining the right macroprudential tools is undeniably an embryonic field. Yet, there are ways to make sense of the seemingly unorganized set of distinct tools. A common manner to present the matter, first used by Borio and Crockett (2000), is to categorize policy instruments based on whether they are mainly designed to dampen procyclicality or to deal with the cross-sectional dimension of systemic risk[2] (Galati and Moessner 2014).

2.4.1 Instruments for Dealing with Cross-Sectional Dimension of Systemic Risk

Given that the key sources of risk in the cross-sectional dimension are common exposures and interlinkages (Caruana 2010), the macroprudential tools need to be addressing these issues in order to be viewed as dealing with this dimension of systemic risk. The instruments in the category include enforcing disclosure requirements, introducing central counterparties

[2] Galati and Moessner (2014) also list alternative manners to categorize the tools. For instance, the distinction can be made based on whether the instrument is used to restrict prices or quantities, as in Perotti and Suarez (2011).

for market participants, employing circuit breakers and setting up resolution regimes for systemically important institutions. This list is by no means comprehensive but is simply meant to familiarize the reader with some of the different choices of tools in addressing the cross-sectional dimension of systemic risk. Also, a thorough analysis even of just these tools would be outside the scope of this paper.

It is widely recognized in the aftermath of the recent financial crisis that granular and timely information is a vital prerequisite for supervising financial institutions. To this end, multiple high level authorities worldwide, such as Financial Stability Board (2011) and BoE (2011), have highlighted the importance of disclosure requirements for financial institutions. One of the goals for this tool would be alleviating problems with common exposures and interrelations in the balance sheets of financial institutions. With improved transparency, the authorities are better able to monitor and, if necessary, moderate the level of risk.

Another relevant macroprudential instrument is setting up a central counterparty (CCP). In case of over-the-counter trading, an overwhelmingly complex network of bilateral exposures between market participants is created and it is, as a result, difficult to understand the distribution of risks in the network. This type of uncertainty can promote panic among investors if a participating institution suddenly faces increased default risk. (BoE 2011) In contrast, if a CCP is introduced, each participant only has a single exposure to the CCP that can address the default risk by requiring its counterparties to hold a margin account. This margin account can then be adjusted according to the volatility of the market so that increased volatility leads to increased expenses of holding large positions, containing the risk appetite of participants. (Caruana 2010) Of course, as BoE (2011) points out, then the CCP, having extreme systemic importance, needs to be particularly well monitored for build-up of risks within itself.

In addition to the CCP solution, the so-called circuit breakers are commonly suggested to provide similar macroprudential benefits in form of calming market reactions in times of distress. Circuit breakers are simply tools for stopping trading in a market place typically used when a price crash occurs. Multiple variants of this instrument have been employed worldwide for decades now. For example, stalling the crisis that later became known as the Flash Crash has been attributed to stopping trading at the time of the market plunge of October 1987. (BoE 2011)

Yet another macroprudential instrument for dealing with the cross-sectional dimension of systemic risk is setting up resolution regimes for the systemically important institutions. In particular, this tool is suggested to alleviate the problem of moral hazard. Resolution regimes would allow even the systemically important institutions to fail in an orderly manner so that excessive risk taking would not be profitable as is the case if the society bails out an institution in trouble but it gets to enjoy the possible returns on its risk taking alone. (Bernanke 2009) Moreover, as Caruana (2010) notes, the regimes should also be designed in such manner that the counterparties of these failing institutions fully carry the risks of their activities. This type of setting is thought to improve market discipline *ex ante*, which should limit the probability of failure in the first place.

2.4.2 Measures for Addressing Time Dimension of Systemic Risk

Regarding the macroprudential tools that fall in the time dimension category, these tools are by definition used to dampen the endogenous procyclicality of the financial system. In this category, principal instruments include countercyclical capital buffers, sectoral capital requirements, time-varying liquidity buffers, dynamic provisioning as well as loan-to-value (LTV), debt-to-income (DTI) and debt-service-to-income (DSTI) limits. As with the tools categorized to the group dealing with the cross-sectional dimension of systemic risk, it is worth noting that the purpose of this set of instruments is similarly only to introduce some of the key macroprudential tools for dampening procyclicality and not to compile a complete list, thoroughly analyzing all of them.

Countercyclical capital buffers, as the name suggests, are tools intended to provide optimally varying capital buffers for financial institutions depending on the cycle progress. Unlike is the case with the traditional manner to employ static capital requirements independent of the phase of the cycle, countercyclical buffers aim to take into account the fact that, say, in the upswing asset prices tend to soar and it is exactly then when debt level should not be allowed to rise, which the static approach would do. In other words, instead of procyclically encouraging, in absolute terms, higher indebtedness because the asset prices are higher, countercyclical capital buffers intend to build resilience in good times, and *vice versa* when the cycle turns.

However, in certain circumstances the simple countercyclical capital buffers may prove too blunt to be efficient since there are often issues only in certain individual sectors. As a

solution, sectoral capital requirements are used, employing risk weights so that exposures to more risky sectors require more capital from the financial institution. This is in a sense the same tool as countercyclical capital buffer but instead of varying capital requirements over time, the required amount of capital is varied in a targeted manner across exposure sectors. Obviously, the approaches can be combined as well, applying different capital requirements to exposures to different sectors and then making these vary according to the financial cycle.

Closely related to the macroprudential tools aiming at moderating capital levels of financial institutions are the so-called time-varying liquidity buffers, the goal of which is ensuring sufficient liquidity in times of distress. The rationale for different liquidity requirements at different times is also similar: in booms it is important to restrain the typical provision of cheap and abundant liquidity and, symmetrically, in busts it is beneficial to relax regulation on liquidity provision not to deepen the scope of problems. Another potential benefit from the use of time-varying liquidity buffers is alleviating the problem with procyclicality in maturity mismatch. In booms, credit expansion is often fueled by short-term funding and this may be particularly destructive when the bubble bursts if the maturities on the asset side of the balance sheet have not been evolving in a similar manner. Hence, by imposing stricter liquidity requirements in booms, discouraging credit expansion through short-term funding, and relaxing these requirements in busts, which, in turn, lowers the average cost of funding, the issue with the procyclicality of maturity mismatch may be alleviated. (BoE 2011)

In addition to moderating capital and liquidity, countercyclicality can be promoted by developing the provisioning standards in place. Historically, the manner banks have made loan loss provisions has been both static and backward-looking in nature since provisions have been made based on realized losses by the end of each period (Mahapatra 2012). As BoE (2011) notes, this practice has led to making too little provisions in good times and facing unexpectedly large losses in bad times. In the aftermath of the recent financial crisis, a consensus is emerging that a move towards the so-called dynamic provisioning scheme is needed, so that the sizes of provisions depend on the stage of financial cycle by taking into account through-the-cycle expected losses. In practice, the tool has been applied by adding a general provision based on long-run historical losses to the traditional loan-specific provision.

While the tools addressing the time dimension of systemic risk introduced so far have only to do with the balance sheets of the financial institutions, another approach to tackle the same issues is to tie the regulation to consumer wealth. For instance, to increase the resilience of

the system to adverse housing market developments, typical instruments used are applying LTV and DTI limits to mortgages. In the former, the maximum amount of housing loan a single household can take is set as a certain proportion of the value of the home purchased. And in the latter, the debt regulation is based on the household income level. (BoE 2011) A commonly used variant of limiting the maximum allowed DTI ratio is to consider the periodic debt service expenses the household faces and relate these to the income level. These tools are often referred to as DSTI limits. (Eerola 2016b)

2.5 Institutional Arrangements

2.5.1 General Requirements for Well-Functioning Organization

Although it is clear that each financial system is unique and requires different type of policymaking, some common features of well-functioning institutional setups for macroprudential regulation can be named. Optimally, the setup would be such that institutional assignment of responsibilities is efficient on top of being clear, mandate as well as powers are well-defined and accountability is ensured. (IMF 2011a)

There are several rationales for assigning responsibilities clearly and efficiently on institutional level. By assigning objectives of macroprudential policy properly, each institution involved is allowed internal consistency in its goals, being able to benefit from synergies and avoid conflicts in decision-making. Also, by clear assignment of responsibilities, the number of agencies involved can be kept small, reducing costs. The cost reductions result from two key factors. Firstly, duplication, that is, engagement of multiple agencies in the same activity, is limited. Secondly, compliance costs tend to increase with the number of agencies the firms need to deal with, so it reduces regulatory burden on the industry to limit the contact points. (Nier 2009)

Equally important as assigning responsibilities across institutions is defining the mandate well. The mandate sets the constraints, within which the macroprudential authority is able to use its powers and thus, without it, it would be difficult to take proper action when required. It needs to be clearly stated in the law that the primary objective is promoting financial stability, but sometimes subordinated secondary goals are justifiable as well. As macroprudential policymaking always imposes costs to the regulated firms, the secondary

objectives could serve to allow for weighing these costs against the benefits from actions, so that a holistic view of the situation could be considered. (IMF 2011a)

Similarly vital is to set out the powers clearly. By naming the powers available for the macroprudential authority in the law, it can then formulate and put to use suitable tools in compliance with the agreed jurisdiction. IMF (2011a) lists three types of powers that are required to conduct macroprudential policy. First, the authority needs to be able to collect information to assess how systemic risk develops over time. Second, to prevent circumvention of the regulation, the authority needs designation power. This means that macroprudential policy needs to cover all the institutions that are important from systemic point of view, not only, say, banks, and hence the regulator has to be able to bring within its supervision the relevant institutions regardless of their legal form. Finally, the macroprudential authority needs to have rulemaking and calibration powers. This translates to being able to flexibly modify the set of policy measures at disposal so that the supervision can keep up with the ever-changing financial system instead of holding on to a possibly outdated static set of rules.

Yet another property significantly affecting the functioning of the institutional setup is its accountability regime, to whom and in which form the policymaker has to answer. Indeed, as Taylor and Quintyn (2002) point out, improper arrangements have aggravated systemic banking crises in the past. While hence indisputably an issue of high importance, it still remains a somewhat open question how the best possible accountability could be achieved in the context of macroprudential policy.

There appears to be agreement in the literature that although the exact same arrangements developed for monetary or microprudential policies cannot be incorporated in macroprudential policymaking, some central elements are applicable (IMF 2011a, Schoenmaker and Wierts 2011). As an example of incomplete applicability, Schoenmaker and Wierts (2011) note that even though political accountability to the Minister of Finance, as is typically the case with microprudential policy, may be desirable since macroprudential instruments often involve using public funds, political interference is potentially harmful. This is due to the fact that independence from political pressures is vital to make the difficult decisions to, say, slow down the overheating during booms. As an example of direct applicability, in turn, IMF (2011a) takes the transparency requirements often set for other types of financial policy, too. Clearly communicating to the public the macroprudential policy strategy and providing detailed analyses of the benefits and costs of the actions taken

allows for maximizing public understanding of the policy choices, which is a key goal in any accountability pursuit.

2.5.2 Coordination with Other Policies

Aside from the general considerations, an issue definitely calling for attention in discussing institutional arrangements for macroprudential policy is its coordination with the wider policy framework for financial sector, including monetary and microprudential policies. Due to the interlinkages between the different policies, it is vital that the effects of policy actions from all three fields are coordinated when attempting to achieve a certain goal. Similarly, a thorough understanding of how the goals of different policies themselves are linked to each other is needed and, in case there are conflicting objectives, the priorities need to be pre-agreed to avoid any delays in decision making.

A neat Tinbergian assignment, as Caruana (2010) termed it, would be to design the framework so that interest rate policy aims at price stability and prudential policies at financial stability. But, in reality, modern economies are not typically simple enough for that to be a feasible solution. Instead, there appears to be a consensus emerging that the different policy instruments along with their objectives are highly interrelated. This is illustrated for monetary, macroprudential and microprudential policies in Figure 1, where the solid lines represent primary impacts and the dotted lines secondary effects.

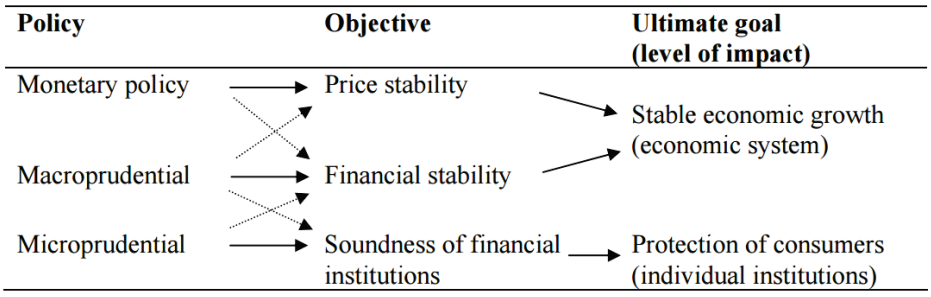

Figure 1: Interrelations of Macroprudential Policy with Other Policies (source: Schoenmaker and Wierts 2011, p. 2)

Monetary policy, affecting interest rate level, arguably has an impact on the collective behavior of financial institutions, which may cause issues from a macroprudential point of view. As a historical example of this, at least some experts blame the prolonged period of low interest rates preceding the recent financial crisis for encouraging the so-called search for yield that led to unusually bold risk taking (Elliott 2011). And even though the effects of

monetary policy decisions from the financial stability point of view are typically likely to be less radical, the interconnectedness is made clear by the example. Schoenmaker and Wierts (2011) further argue that since both monetary and macroprudential policy have the same ultimate goal, stable economic system, one cannot be considered more important than the other but the two need to be conducted side by side as equals.

Similar connectedness as with monetary and macroprudential policies is true for microprudential and macroprudential policies, as well. Microprudential policy, setting some of the rules for individual financial institutions to work by, indisputably affects also the sum of these insitutions. But although a consensus has been reached on the insufficiency of only regulating individual institutions to ensure stability of the system as a whole (Caruana 2010), Schoenmaker and Wierts (2011) go on to argue that the two goals might even be conflicted in some cases. For instance, it might be best for the soundness of a single institution to sell an asset when the risk of its price collapsing reaches a certain level, but if this is the collective thinking, the resulting fire sales only enhance correlations and volatility. Therefore, microprudential policy may, in some cases, be viewed as destructive from the macroprudential point of view. Moreover, unlike with the equally important objective of monetary policy, it can be argued that the stability of the entire system as a goal is more important than the soundness of individual institutions because the system-wide issues will also inevitably take down the individual institutions (Schoenmaker and Wierts 2011).

2.5.3 Stylized Agency Structure Models

Following the classification by Nier (2009), among the countless possible alternative ways to organize the financial stability supervision, two distinctive structure types[3] can be identified, namely, the single integrated regulator (SIR) model and the twin-peaks model. Naturally, these models can, and often in practice are, combined, leading to a solution that can be termed a hybrid model.

From 1990s onwards, a multitude of countries have been developing their regulatory structure by reducing the number of agencies, many of them ending up adopting some variant of the SIR model. As the name suggests, a key characteristic of the SIR model is that there is one integrated regulator, being responsible for securities markets, pension and mutual

[3] In Nier et al. (2011), the classification is extended to include seven stylized models but for the purposes of this paper the simpler two-model stylization suffices.

funds, insurance companies as well as commercial banks. Importantly, the integrated regulator is also responsible for conduct of business regulation, setting the rules for trading practices and products offered in financial markets with the focus on consumer and investor protection. Another central feature of the model is that the central bank along with its monetary policy and financial stability functions is separate from the integrated regulator. However, close co-operation between the two authorities is typical.

The choice to integrate several regulatory roles in one agency involves some trade-offs. On one hand, decreasing the number of agencies is beneficial as such since it can help reduce costs by limiting duplication by the authorities and the regulatory burden on the industry. On the other hand, several issues especially from the macroprudential perspective are present. For instance, due to the number of roles the integrated regulator has, it may be tempted to overinvest resources in some activities at the expense of others. This is a valid risk scenario particularly in the case of conduct of business regulation versus macroprudential regulation[4], the former of which being more visible to the public and also politically more popular. In addition, the macroprudential responsibilities are often not assigned clearly enough, so that there are accountability and incentive shortcomings. Typically, the central bank provides a periodic financial stability report and is thus in the best position to understand the risks prevailing in the system. But the tools to address these imbalances are mostly vested in the separate agency in the SIR model, resulting in a situation in which neither can be fully accountable for the macroprudential outcomes. Moreover, due to the vague role of the central bank in the model, the structure fails to fully benefit from the intrinsic incentives central banks have to promote financial stability. Indeed, as central banks, say, act as the lender of the last resort in crisis resolution, they have built-in incentives to prevent systemic crises. And if they are not equipped with the required policy instruments, harnessing these incentives remains lacking at best.

An alternative manner to organize financial sector regulation is illustrated by the so-called twin-peaks model. The twin-peaks model attempts to address the shortcomings in the SIR model while preserving its central virtues. In the alternative model, the financial sector regulatory structure comprises two separate agencies, a systemic risk regulator and a conduct of business regulator. The former role, regulating systemic risk, is clearly assigned to the central bank. Thus, as opposed to the logic behind the SIR model to minimize duplication

[4] For more on this issue, see for example Herring and Carmassi (2008), who express concerns about the ability of the integrated supervisors to perform in a crisis.

and the number of regulatory contact points for firms, the structure in the twin-peaks approach has its basis in the principle that each agency can focus on a single objective.

As with the SIR model, the twin-peaks approach, too, has its strengths and weaknesses. On the positive note, for example, the risk associated with the authority disproportionately focusing on conduct of business regulation while neglecting its macroprudential duties is no longer present as neither agency needs to divide attention to the two tasks. In addition, the natural incentives of the central bank to promote financial stability can be fully harnessed with it taking responsibility of systemic risk regulation alone. As for the problematic features of the twin-peaks model, the solution may be more expensive than the SIR model, and issues related to insufficiency of powers at disposal may arise, too. The reason for the likely increase in costs of the structure lies, of course, in the same observation that has justified the move to the SIR model for many countries: the compliance costs tend to build up when firms need to deal with multiple regulators. Also, in case conduct of business regulation is required to support systemic risk reduction, the central bank does not control all the relevant tools since another agency is fully responsible for conduct of business regulation and thus has the instruments associated with the field at its disposal.

Due to the limitations of the SIR and twin-peaks models, many countries favor a combination of these approaches, adopting a hybrid model. As is clear, there are many ways to combine the stylized models, so mere examples can be outlined. Country-specific factors, such as level of financial development and distribution of assets in the financial sector play a central role in deciding how the organization should be implemented. For instance, if there are several smaller banks but also some of high systemic importance, it may be desirable to dedicate a separate agency to supervising the individually less important institutions so that the central bank can focus on the ones that alone may pose systemic threat. In this case, the basic building block would be a simple twin-peaks model augmented with an additional agency that would take a general role similar to the one of the integrated regulator in the SIR model, with the difference that the extra agency would only be responsible for the systemically smaller institutions. Here as well the same benefits and costs from the additional supervisory complexity apply as with the SIR and twin-peaks models. (Nier 2009)

Regardless of their specific form, there seems to be common factors in the agency structures. One key element in the vast majority of the structures employed in organizing financial

sector supervision around the world is the strong presence of the central bank[5] in macroprudential work (IMF 2011a). This is suggested to be the optimal choice by multiple observers, including Schoenmaker and Wierts (2011). The reason behind this phenomenon, as noted, is that the central banks typically have both the expertise and the incentives to pursuit a stable financial system. Another common feature of the models is that the number of agencies involved is generally quite low as no more than three separate agencies are employed in any of the structures set out. Hence, it appears that highly fragmented, multilateral agency structures are rarely optimal, as Nier et al. (2011) argue, too.

2.5.4 Existing Setups

Given the purpose of the stylized models in general to put complex matters in a simple form, it should come as no surprise that the actual existing institutional setups never match the stylizations perfectly. Moreover, the models discussed in the previous section only considered agency structures. However, the institutional organization of macroprudential policy in different regions goes into significantly more detailed level when examined further. Beyond assigning responsibilities to different regulators such as the central bank, there are committees, boards and councils on both international and national levels with members from different agencies (IMF 2011a). Two illustrative real-life examples of somewhat different regions in this regard are provided by the US and the European Union (EU).

On the agency level, the US financial sector regulation has for some time now closely resembled the example of a certain hybrid model type discussed above (Nier 2009) and the structure, at least in terms of degree of agency integration, has not gone through significant changes after the recent financial crisis unlike in many other countries (Nier et al. 2011). Even after the 2010 Dodd-Frank Act that reformed financial sector regulation in the US, the key elements of the institutional setup from the macroprudential point of view have remained by and large unchanged. For example, the prudential regulatory agencies still are the Federal Deposit Insurance Corporation (FDIC) and the US central bank Federal Reserve[6], co-operating with a number of conduct of business regulators of varying sizes (Murphy 2013).

[5] For an inspection of how the role of central banks has evolved over time from the 1840s forward, see Goodhart (2011).

[6] Defining Federal Reserve as the US central bank is, in fact, somewhat simplified representation of the true state of matters, that is, in the US, there is in place a more complex Federal Reserve System comprising three separate entities, the Federal Reserve Board, 12 Federal Reserve Banks and the Federal Open Market Committee (Federal Reserve System 2016). However, following the literature standard (see for example Aikman et al. 2013, Nier 2009 and IMF 2011a), the Federal Reserve Board, the entity actually involved in macroprudential policymaking (Murphy 2013), is here referred to as the Federal Reserve.

Furthermore, the division of labor between the two prudential agencies is fairly similar to the one described in association with the hybrid model example: while the FDIC is responsible for supervising the large fringe of smaller institutions, the central bank can specialize in supervision of institutions that are individually systemically important. Also, the responsibility of implementing the orderly resolution of failing financial firms is assigned to the FDIC. (Nier 2009)

On the interagency body level, in turn, the US model was reformed somewhat with the introduction of the Dodd-Frank Act in 2010. The central new feature of the setup established was the Financial Stability Oversight Council (FSOC), taking the role of macroprudential policy coordinator (IMF 2011a). In total, there are 15 members in the council from the constituent agencies, including the Federal Reserve. The FSOC has a clearly macroprudential mandate of identifying and responding to risks that threaten financial stability, enhancing market discipline as well as eliminating expectations of government bailout. (Aikman et al. 2013) As noted, the FSOC coordinates macroprudential policy, with the implementation left for the agencies, such as the FDIC and the Federal Reserve. Importantly, the FSOC is empowered to designate certain institutions as individually systemically important so that they become supervised by the central bank at a heightened degree in comparison with the supervision of the FDIC. (IMF 2011a)

Due to the fact that the EU is in many ways a different sort of union compared to the one the constituent states form in the US, the financial sector regulatory practices are significantly more fragmented within the EU than they are across the US states. The central underlying reason is the degree of independence of the countries in the EU relative to the US states. For instance, even the countries in the monetary union have their own national central banks in addition to the ECB, while there are only 12 Federal Reserve Banks in the Federal Reserve System. Moreover, whereas it is common for the EU countries to have prudential agencies of their own, in the US, the key regulatory agencies are responsible for all of the states. (Murphy 2013)

Despite the differences between the EU and the US, there are some features that can be viewed as common when comparing union and federal level regulation. Much like the FSOC, after the recent financial crisis in 2011, the European Systemic Risk Board (ESRB) was established (IMF 2011a). The ESRB has a unique status as the only supranational institution of its kind in the world (Nier et al. 2011). The board has in total 69 members, including the ECB President, the national central bank governors and representatives from

the supervisory agencies (Deutsche Bundesbank 2016a). Similarly as with the FSOC, the mandate is macroprudential in its nature, obligating the ESRB to "prevent or mitigate systemic risks to the EU financial system". (Aikman et al. 2013, p. 12) The powers vested in the ESRB are mainly of advisory type; it can issue non-binding recommendations and warnings to any authority with the so-called comply-or-explain mechanism. (IMF 2011a)

Another supranational authority worth mentioning in the EU is the rather novel banking union. Although the ECB (2016b) clearly states that the ESRB is responsible for macroprudential supervision of the financial system in the EU, the work in the banking union undeniably touches its domain. Both elements in the banking union, the Single Supervisory Mechanism (SSM) and the Single Resolution Mechanism (SRM), have much to do with macroprudential goals. While the SSM lists as its goals, *inter alia*, ensuring the safety and soundness of the European banking system as well as increasing financial integration and stability, the equivalent of the SRM is ensuring the efficient resolution of failing banks (ECB 2016b). In addition to the somewhat overlapping domains at least in the goal level, the launch of the SSM in 2014 also strengthened the position of the ECB as a macroprudential authority. Although the national authorities still essentially control the use of macroprudential instruments, the ECB can now impose or intensify certain macroprudential measures in the participating countries (Deutsche Bundesbank 2016a). Regarding its scope, however, there are some limitations for the SSM and hence the macroprudential powers of the ECB compared to the ESRB. The SSM only automatically obligates the euro area countries, with an option to participate for the other EU countries (ECB 2016b), whereas the ESRB powers apply to every EU nation (ESRB 2016).

As regards the national institutional setups, there are varying practices across the EU countries, and the structures have been reformed quite a bit in the recent years, too. Many countries, including Germany and Finland, for example, adopted some variant of the SIR model during the first decade in the new millennium (Nier 2009), but with the recent developments at the union have moved towards more complicated structures (Aikman et al. 2013). Most notably, new interagency bodies have been established and given a coordinating role.

In Germany, the turning point for institutional arrangements for macroprudential policymaking was the Act on Monitoring Financial Stability, leading to the establishment of the German Financial Stability Committee (G-FSC) in 2013 (Deutsche Bundesbank 2016b). As in the US, the need for reforms was recognized in Germany as well in part because of the

subprime-related losses in 2007. Due to these problems, the regulatory framework in place at the time was questioned, especially regarding the resolution solutions. Bundesbank and the German integrated regulator, Federal Financial Supervisory Authority (BaFin) shared responsibility for banking supervision but issues were noted concerning the clarity and transparency of their division of labor. (Nier 2009) The Act on Monitoring Financial Stability addressed, among others, these issues and the G-FSC now coordinates the macroprudential supervision at the national level, with the Federal Agency for Financial Market Stabilisation (FMSA) acting as the resolution authority in Germany as a part of the SRM. The G-FSC has three voting members from the Federal Ministry of Finance, the German central bank Deutsche Bundesbank and the BaFin as well as a non-voting member from the FMSA. Thus, the central bank plays a key role in German macroprudential policymaking, in addition to its responsibilities in providing analyses to support the policy decisions.

As for Finland, too, relevant reforms in the regulatory structure were implemented in the recent history. In 2009, the SIR model was fully adopted when the Financial Supervisory Authority (FIN-FSA) was established, taking on supervisory responsibilities of all financial sectors (Nier 2009). In Finland, the board of the FIN-FSA still decides on the use of macroprudential tools. However, there are members in the board from, among other agencies, the Finnish central bank Bank of Finland (BoF), so as in the stylized model, the central bank is involved in macroprudential policymaking. (BoF 2016c) In 2015, the Financial Stability Authority was also established, operating as a part of the SRM as a resolution authority in Finland (Financial Stability Authority 2016) like the FMSA does in Germany.

Aside from the regional and national institutional setups for macroprudential supervision, there is an example of major importance in the global context as well, namely, the Basel Committee for Banking Supervision (BCBS). As with many other macroprudential committees, its mandate states financial stability as its goal (BIS 2015a), and there are members from the national central banks of the participating countries from all over the world (BIS 2016). Moreover, although the committee solely plays a role in banking sector supervision and does not take a stance on supervision of other sectors like the national integrated supervisors typically do, it nonetheless undeniably has a central role in macroprudential policy due to the size of the banking sector. (BIS 2015a) The BCBS has no legal power but rather the committee deals recommendations for standards in prudential

regulation. In addition, since 2012, it has monitored their implementation, too. (BIS 2015b). The BCBS has become the primary global standard-setter for the banking sector prudential regulation (BIS 2015a). Examples of the central recommendations of the committee include the 2006 Basel Core Principles that were later revised in 2012 (BIS 2012) as well as the Basel I, Basel II and Basel III, all which can be viewed as reform packages with varying contents, sharing the common aim of promoting banking sector stability (BIS 2015b).

2.6 Effectiveness

2.6.1 Difficulties in Measurement and Some Proposed Solutions

The concept of effectiveness for macroprudential policy has multiple dimensions. Improving financial stability by mitigating systemic risk is the arguably quite general goal of macroprudential policy. However, while it is useful to determine the goal this generally to put macroprudential policy in its place in the wider policy framework for financial sector, the stability of the system is undeniably too vague an objective to be used as a benchmark, against which the effectiveness of single policy tools should be measured. Instead, intermediate objectives, like curbing credit expansion, can be set as well and, as Schoenmaker and Wierts (2011) suggest, each policy instrument could then be assigned to one of these objectives to be able to measure their success. It is thus useful also to separate effectiveness in the sense of achieving the intermediate targets and in the alternative sense of achieving the wider goal of financial stability for the purpose of its measurement, following Galati and Moessner (2014).

As for the general issues causing difficulties in measuring effectiveness of macroprudential policy, both at intermediate and at ultimate goal levels, most of them have to do with the novelty of the adoption of the regulatory approach. Indeed, since a consensus on the need of macroprudential policy has emerged only after the recent financial crisis, scarcity of experience on the use of the policy measures as well as lack of established theoretical models and solid empirical evidence all understandably limit the precision with which the outcomes of policy actions are currently comprehended. (Galati and Moessner 2014) Most notably, as the Committee on the Global Financial System (2010) highlights, the transmission mechanisms through which macroprudential policy instruments work are not thoroughly understood as there is no clear-cut modeling framework for how the financial system and the macroeconomy interact with each other.

Recently, however, significant effort has been undertaken to fill these gaps in the knowledge about the effects of macroprudential policy tools, especially on the intermediate target level. Galati and Moessner (2014) distinguish three branches of research attempting to measure effectiveness of macroprudential policy in this sense. Firstly, theoretical approaches, namely, banking and finance models, three-period general equilibrium models as well as infinite horizon macroeconomic models with financial factors have been employed frequently in the recent literature. Secondly, an alternative branch of research clearly emerges in the field termed stylized presentations, typically involving so-called transmission maps and being narrative in style. Thirdly, various different empirical strategies have been tried as well.

In the banking and finance models, as categorized by Galati and Moessner (2014), information asymmetries and incentive problems, among others, affect financial contracts. In this type of modeling, financial stability can be threatened by different types of shocks impacting the institutions through balance sheet interlinkages. An important contribution to this literature is provided by Perotti and Suarez (2011) who study the effects of price-based and quantity-based policy instruments, arguing for a Pigovian approach, that is, a tax on short-term funding to make banks internalize the negative externality they impose by engaging in this activity. A key merit of the banking and finance models is that they can explain the complicated borrower-lender interaction. However, these types of models have central disadvantages in macroprudential context, too. For instance, not being able to take into account the role of financial cycles, they are poorly suited for assessing the effectiveness of the tools addressing the time dimension of systemic risk.

Partly as a solution to the issue with neglecting the impact of the financial cycle, three-period general equilibrium models, the second theoretical approach listed in Galati and Moessner (2014), have been employed for analyzing the effects of different macroprudential instruments. This type of modeling is characterized by involving risk-taking agents whose behavior affects the financial stability through asset prices. Again, externalities are considered and they arise because agents fail to take into account the general equilibrium effect their actions have. Goodhart et al. (2012) represent this literature with their model that can be employed for analyzing five different types of macroprudential measures, such as dynamic loan loss provisioning. Despite being highly stylized, the three-period general equilibrium models have been able to provide valuable insights for assessing how the introduction of certain macroprudential policy tools would affect the economy.

The third group of models in theoretical approaches described in Galati and Moessner (2014), the infinite horizon macroeconomic models with financial factors, was of very limited use until recently because of problems that have now been overcome in large part. After the recent financial crisis, progress has been made in, for instance, how these infinite horizon DSGE models are solved which has resulted in significant improvement in the usability of the models. Since they were originally solved by linearization, the models were unable to incorporate state-contingency meaningfully and thus were unsuitable for analyzing, say, crises. However, now that these technical issues have been solved, the infinite horizon DSGE models have been widely used for purposes of evaluating effectiveness of macroprudential policy. Brunnermeier and Sannikov (2014) contribute to this literature with their influential paper presenting a model that can be used for studying financial regulation interventions through conducting a welfare analysis. In their model, the economy is unstable due to its feature that leverage and risk-taking behavior are endogenous. The key property of the model from the financial stability point of view is what the authors term volatility paradox: even with very low exogenous risk, endogenous risk persists in the system since leverage increases as fundamental risk decreases[7].

Aside from the theoretical approaches in measuring effectiveness of macroprudential policy, Galati and Moessner (2014) distinguish an alternative branch of research with the same goal that the authors call stylized presentations. Papers in this category are typically narrative and study the transmission mechanisms of certain macroprudential instruments. An important example from this field is provided by the Committee on the Global Financial System (2012). A central feature in this work is the presence of the so-called transmission maps, descriptions of how individual instruments are expected to affect the macroprudential policy objectives. In spite of having the potential to contribute to the effectiveness discussion with uniquely broad-based perspective, the obvious shortcoming in this line of research is the inevitable high degree of subjectivity.

Finally, in addition to the theoretical approaches and stylized presentations, Galati and Moessner (2014) consider the empirical analyses on the effectiveness of macroprudential policy measures. This branch of research, too, has seen significant progress over the past few years. In part, the development is enabled by the recent improvements in our

[7] This feature, as Brunnermeier and Sannikov (2014) point out, resolves the so-called Kocherlakota (2000) critique. Put simply, the model by Brunnermeier and Sannikov (2014) explains how a shock can take the system far away from the steady state unlike in the models such as the one by Kocherlakota (2000), in which the system is on a sure recovery path after being hit by a shock.

understanding of the interaction between the macroeconomy and the financial system, and, in part, the available data have been enhanced in quantity as well as in quality. Several empirical strategies have been employed in the literature, including event studies and reduced-form regression analysis. For example, Bruno and Shin (2014) study the effects of macroprudential policy measures in Korea using panel data from close to 50 countries in their regression analysis. Concerning the types of policy tools studied empirically, as Borio (2009) notes in addition to Galati and Moessner (2014), the ones addressing the cross-sectional dimension have been generally underrepresented in the literature mainly due to data limitations.

Regarding measuring the success of macroprudential policy in terms of achieving the goal of promoting financial stability, several issues persist even if the effects of individual tools on their intermediate goals were thoroughly understood. In particular, knowing with high precision, say, how much an introduction of a dynamic provisioning scheme would affect the leverage of banks in different phases of the financial cycle would still not give an unambiguous answer to the financial stability effects of the tool. (IMF 2011a) As is obvious, the stability of the system is a sum of countless factors, so it is near-impossible to attribute either achieving this state or failing to maintain it to single policy measures. Moreover, since macroprudential policy is not conducted in isolation, and many argue that, say, monetary policy, too, plays a role in financial stability issues (Elliott 2011), it is difficult enough even to determine the effect of the employed macroprudential tools combined. Further complicating the interpretation of the financial stability effects of macroprudential instruments, as Horváth and Wagner (2013) show, some policy tools may succeed in addressing issues in the time dimension of systemic risk but simultaneously impair the situation in the cross-sectional dimension. Thus, trade-offs might be involved in terms of different intermediate objectives, and the effect regarding the ultimate goal may remain ambiguous in certain cases.

Some of the underlying problems can be best understood when macroprudential policy is once again compared to monetary policy. Unlike is the case with the continuously observable inflation target of monetary policy, there is no equivalent quantitative goal for macroprudential policy related to financial stability. As macroprudential policy is all about managing a tail risk, to be able to determine how successful it is in this sense, one would need to measure the effect of policy actions on the probability and severity of a crisis, an objective that seems clearly unachievable with the currently available tools. (IMF 2011a)

2.6.2 Commonly Faced Implementation Issues

Although the literature on measuring effectiveness of macroprudential policy is still in its infancy, what we do know about the tools is that there are several potential issues in employing them in practice. For ease of exposition, the numerous types of problems faced can be categorized in three groups. First, sometimes policy actions may not work as desired. This problem can present itself either in the form of the measures having practically no effect at all or having severe unintended consequences. Second, the financial firms may be able to circumvent the regulation fully or in large part, so that while effective, the policy misses at least part of its target. Circumvention, also known as regulatory arbitrage, can be an issue because not all relevant sectors or firms within a single jurisdiction are covered by the regulation, or then it may be the case that the firms can operate across different jurisdictions and thus circumvent the rules. Third, the policymakers themselves may not be either willing or able to make the decisions when required. Typical reasons for inaction include political pressures and conflicting interests in the decision-making institutions.

As for the policy measures not working as planned in the sense of having non-existent effects, the problem typically has its roots in the policy tool being constrained. A common example of such a setting, discussed in Hanson et al. (2011), is one in which the authorities attempt to conduct countercyclical macroprudential policy by loosening capital requirements in a downswing. Now, it may be the case that the capital requirement was not binding to begin with, that is, banks already held more capital than was required, and thus the change in policy has no effect. As Aikman et al. (2013) put it employing terms often used when discussing monetary policy, in situations like these macroprudential policy, too, may risk only pushing on a string.

Another form of macroprudential policy not working as desired is that it has unintended consequences. For instance, the issue may be present in case a policy tool has both damaging and beneficial effects for financial stability (Horváth and Wagner 2013). Also, it is possible that although the macroprudential tool does what it is supposed to do from the financial stability point of view, it results in undesired outcomes from a social policy perspective. This is often documented to be the problem with instruments such as uniform loan-to-value caps because typically young households have the least savings and would hence require higher LTV ratios in their mortgages. (Duca et al. 2010)

Regarding other issues, a central shortcoming with various tools is that their sectoral coverage is insufficient and financial institutions can thus circumvent regulation. BoE (2011) provides a relevant example of a problematic macroprudential tool in the wake of the recent financial crisis. If sectoral capital requirements are employed with the purpose of limiting risks arising from the housing markets in particular, all exposures related to the same exuberant sector need to be considered. In this case, in addition to applying stricter capital requirements to housing loans, the authority also needs to appropriately regulate structured financial instruments backed by residential mortgages to actually address the underlying risk in all its forms. Otherwise it is clear that banks wanting to increase their exposure to housing loans can circumvent the direct regulation for mortgage lending by taking long positions in mortgage-backed securities.

In addition to undermining the effectiveness of macroprudential policy, another adverse consequence of regulatory arbitrage is that it can shift, and potentially hide, systemic risk in other parts of the financial system where the regulation cannot reach, a phenomenon known as the water-bed effect (BoE 2011). The so-called shadow banking system and its recent growth can be viewed as a manifestation of the effect. Hanson et al. (2011, p. 15) define the shadow banking system as the "various investors who acquire asset-backed securities and finance them with short-term debt", and the group, typically consisting of institutions such as hedge and money market mutual funds, has traditionally been able to operate outside the reach of regulators (IMF 2011a). The central problem here is that while the shadow banks engage in banking activities like significant maturity transformation, they are not regulated like banks and can hence be excessively leveraged (BoE 2011). The leverage then allows for risk taking markedly above the socially optimal level.

Hanson et al. (2011) provide an illustrative example of the detrimental consequences of the phenomenon from the recent financial crisis in the US. If a hedge fund decided to buy $1 billion worth of asset-backed securities, it was required to make a down payment more commonly known as a haircut, a certain percentage of the value of its purchase. Before the crisis, these haircuts were as low as two percent for the securities of the highest credit rating, implying that for the $1 billion purchase the hedge fund only needed $20 million of its own funds. During the 2000s, this caused the market to increase its value by hundreds of percents over a mere couple of years. However, when the risks associated with the loans started to realize, the haircuts skyrocketed, forcing the hedge funds to increase their down payments for their holdings. Now, as the haircuts rose to 50 percent and higher, a hedge fund

possessing holdings of $1 billion in these securities was suddenly required to post a down payment of some $500 million. The only option left for the hedge funds in this new setting was typically to liquidate their securities and the resulting fire sales then caused the entire market to collapse. Hanson et al. (2011) further note that the disruption to the market might be a real-life example of the margin spiral, term used in the influential model by Brunnermeier and Pedersen (2009) to describe a situation in which required margins increase in market illiquidity. The development leading to the disappearance of the market and the collapse itself are illustrated in Figure 2.

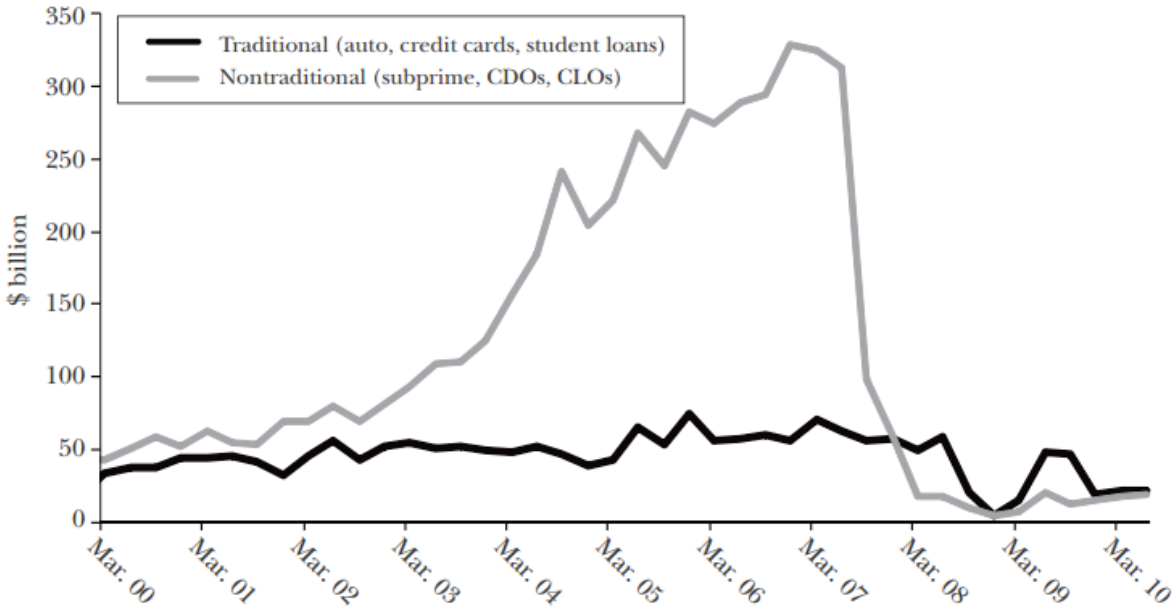

Figure 2: Issuance of Asset-Backed Securities in the US (source: Hanson et al. 2011, p. 14)

Besides cross-sector circumvention and insufficient firm coverage of regulation as in the case of shadow banking, financial institutions can sometimes also arbitrage regulation away by taking advantage of different rules in different jurisdictions. For example, banks can engage in direct cross-border lending or lend via their foreign branches in order not to be subject to local regulation (BoE 2009). Moreover, as Galati and Moessner (2014) argue, this is a particularly relevant problem in the euro zone. Under the single market rules, in all of the EU, banks have both the right to open branches in other member states and offer cross-border services (BoE 2009), which is naturally made even more convenient by the common currency in the countries using the euro. And despite the recent introduction of the ESRB, the member states still primarily conduct their own macroprudential policy, so that differences in regulation across nations persist.

Yet another category of issues faced are the difficulties related to inaction by policymakers, and one central reason for this is the so-called political paralysis. As acknowledged widely in the context of monetary policy, unless independence from political pressures is ensured for the authorities, especially in booms, it may prove impossible to take action against the quite common but false feeling of getting rich by the endless upswing (Borio 2009). Indeed, as Borio (2014, p. 37) puts it, "the essence of good macroprudential policy is to take the punchbowl away just as the party gets going". The author goes on to argue that, in fact, the task is even more difficult in this context than is the case with monetary policy, *inter alia*, because the lag between the macroprudential measures and their outcomes is longer than with the equivalents of monetary policy.

Furthermore, political inaction issues may be present because of the composition of the group making the decisions. For instance, since finance ministries often are prominently involved in macroprudential decision making, unlike is the case with the significantly more independently made monetary policy decisions, tax revenue considerations may cause the ministries to oppose macroprudential policy measures in booms (IMF 2011a). And in addition to tensions between macroprudential and fiscal policy, similar issues with different goals can arise between macroprudential and microprudential perspectives if the latter is also presented in institutions promoting financial stability. Country experience shows that for microprudential authorities it may be difficult to support prudential measures in booms when their view is that the institutions appear sound. Borio (2014) provides an example from Switzerland, in which the central bank proposed activating a countercyclical buffer but the local prudential authority openly opposed it. Schoenmaker and Wierts (2011), too, emphasize that while decision making in committees, which is a typical way to organize macroprudential policymaking, is more balanced, the benefits are not necessarily extended to committees representing institutions with differing objectives. For example, Visser and Swank (2007) provide relevant insights for committee decision making, showing that when preferences differ considerably, concerns over reputation induce members to manipulate information and vote strategically.

3. HOUSING MARKETS FROM MACROPRUDENTIAL VIEWPOINT

3.1 Special Features Important for Financial Stability

Historical data show that a multitude of house price boom-bust cycles have been associated with severe financial crises even before the recent one. Various key characteristics of disturbance in housing markets are such that, in the light of what is known about the systemic risk, they are highly prone to causing serious system-wide issues. These problematic features of bubbles in housing markets include their high likelihood for simultaneous credit expansion followed by a steep contraction and typical immensely wide real-economy consequences through supply-side effects. Also, housing is of particular importance as a storage of wealth for households. Finally, house prices have the intrinsic tendency to significant fluctuations and slow adjustment because of illiquidity and opacity in the market. (Crowe et al. 2013)

Regarding the data from previous financial crises around the world, a clear pattern appears to emerge showing that there is a strong correlation between house price boom-busts and systemic crises, with the house price bubbles also associated with more severe problems than is the case in the crises not preceded by housing sector issues. Crowe et al. (2013), for example, analyze 46 systemic banking crises finding that more than two-thirds of them took place following a house price boom-bust cycle. Selected cases illustrating this association are shown in Figure 3. Obviously, the recent financial crisis was not a special case but rather confirmed a clear historical regularity (Hartmann 2015). Moreover, not only is the correlation evident but Claessens et al. (2009) also find evidence suggesting that recessions preceded by house price busts and credit contraction tend to last longer and be more severe than other recessions.

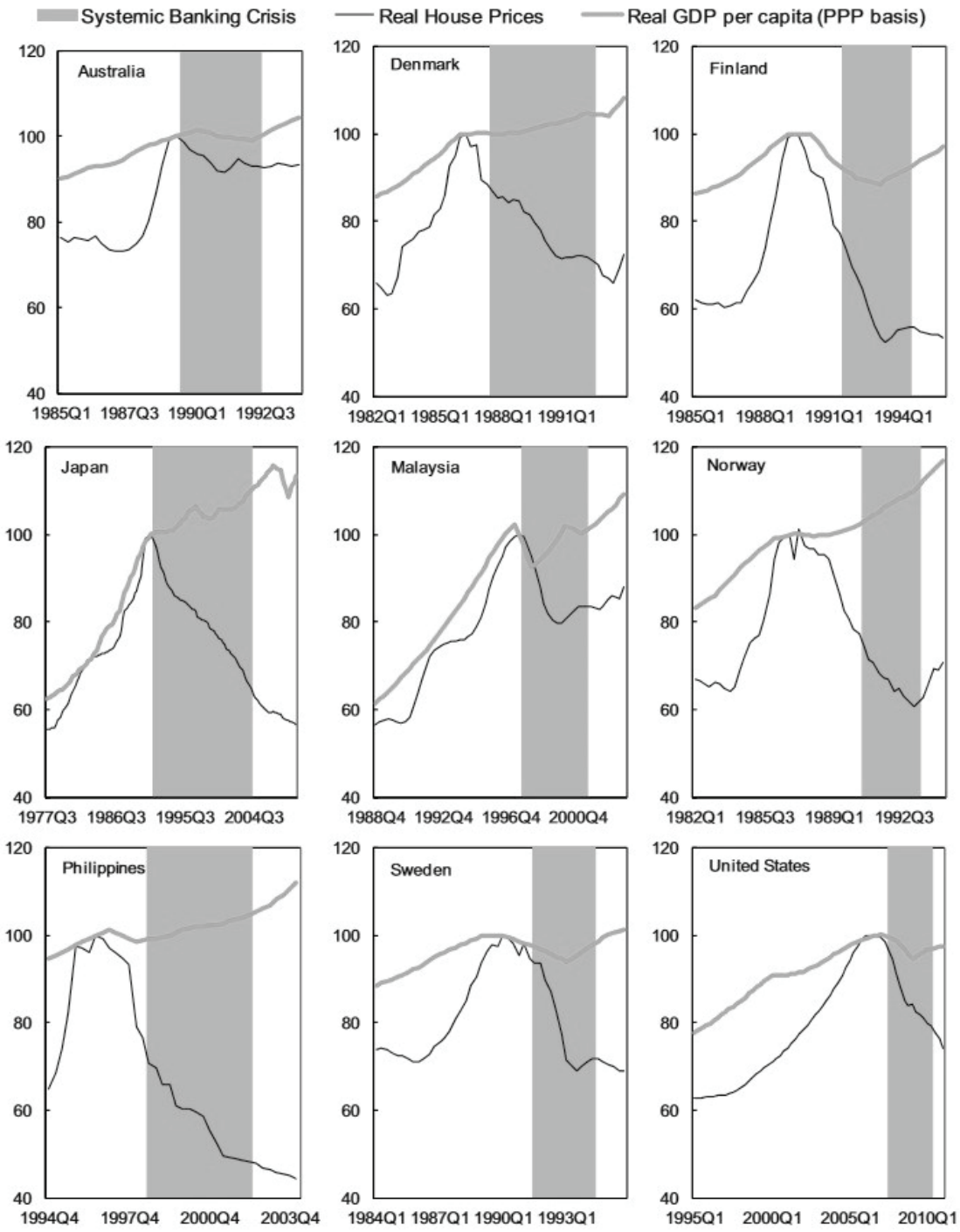

Figure 3: House Price Bubbles and Financial Crises (source: Crowe et al. 2013, p. 303)

The central take-away from findings such as the ones by Claessens et al. (2009) may be in the details since the authors document distinctly deep recessions being associated with precisely the combination of a burst of a house price bubble and a credit crunch. Findings like these seem to support the case of the advocates of leaving direct asset price moderation outside of the mandate for macroprudential policy, including BoE (2011); it appears indeed that more important than the bubble itself is how it is funded. Crowe et al. (2013, p. 301),

too, voice their support for the view, providing as well the stock market driven dotcom bubble as an example of an event leading to "a relatively mild recession" due to the limited role the banking sector and lending in general played in the crisis. The underlying reason here is that busts have a tendency to be more destructive when the boom is funded largely by credit and leveraged institutions are providing the funding because then, in the bust, some of the borrowers often default on their loans. This results in credit contraction harming the real economy when lenders need to adjust their balance sheets for the bad loans (Crowe et al. 2013).

The above-described features of destructive financial crises are also factors making housing markets a sector of particular interest for macroprudential policy. In fact, the properties of historical price bubbles that have often been followed by severe and lengthy recessions aptly characterize the properties intrinsic to housing markets. Crowe et al. (2013) point out several similarities in this regard. For instance, home purchases are nearly always funded by credit, with a significantly higher loan value relative to the collateral asset than is the case typically with other loans. An illustrative example from the US during the 2000s is that the value of mortgages as a percentage of the real estate assets held by households fluctuated around 45 whereas the securities credit relative to corporate equity of the same group remained below 5 percent. Furthermore, housing markets often involve central financing contributions from banks and other leveraged institutions, so that when marked disturbance is experienced, the credit supply is highly likely to decrease[8].

Another factor making the case for macroprudential policymakers to keep a close eye on housing markets is the significant real-economy effects disturbance in this sector has. Crowe et al. (2013) distinguish two different housing market properties of high importance to real economy. First, as housing is likely the most notable storage of wealth for households worldwide, it is clear that changes in house prices have relatively large private consumption effects. In comparison with stock ownership, again, it is far more common for households to hold housing wealth; in the US about half of the households own corporate equity either directly or indirectly but homeowners constitute approximately two thirds of the household count. Moreover, as Case et al. (2005) find, the marginal propensity to consume out of housing wealth is greater than that of financial wealth, further magnifying the effect changes

[8] As Crowe et al. (2013) note, the amplification mechanism caused by simultaneity of asset price decline and credit contraction potentially works both ways, so that in booms, the increasing house prices support credit expansion as well. In the tradition of Kiyotaki and Moore (1997), this is often modelled so that the collateral role of property magnifies fluctuations to either direction as the real estate cycles are highly correlated with credit cycles.

in house prices have on private consumption. Second, the housing market dynamics have important supply-side effects, too. There are many transmission channels, obviously, but perhaps the most notable one is the construction sector. Not only does this sector typically contribute significantly to total value added and hence gross domestic product (GDP) but construction industry is a considerable employer as well.

Yet another feature of housing markets highlighting their importance from the financial stability point of view is the intrinsic propensity to price bubbles. Even in the absence of distortionary mechanisms, such as those present in the recent financial crisis in the US, housing markets tend to show frequent boom-bust cycles for a few principal reasons. Primarily, several factors complicate price discovery in the market. These include infrequent trades, high transaction costs and indivisibility of the houses, that is, owners cannot sell only a part of their house in times of distress. In addition, externalities are involved, further complicating the dynamics. For example, in busts, foreclosures commonly decrease the prices of all the houses in the neighborhood, and this externality is not internalized in the behavior of households, leading to socially excessive risk taking.

Despite the central role housing markets have played in crises already before the recent one, it was not until very lately that the advocates of early intervention to house price bubbles were lent significant support. Although there were differing opinions among both academics and policymakers even prior to 2007, the dominating view was that not taking action is the best choice. It was commonly deemed extremely difficult to detect asset price bubbles, and the associated costs with intervention were also thought to be larger than the damage done by the burst of the bubble. The policy approach more or less to neglect housing market disturbance was followed especially in the US (see for example Bernanke 2002) but multiple influential European policymakers agreed at least to some extent (see for example Trichet 2005). After the real estate bubble burst in the US and was followed by a particularly deep recession worldwide, the pre-crisis stance not to intervene in housing markets has been strongly challenged. The lean camp in the so-called lean versus clean debate, referring to either leaning against the inflating bubble or cleaning up after it, has gained more popularity. This, in turn, has resulted in growing use of tools to address housing market stability issues. (Crowe et al. 2013)

3.2 Lender-Based Tools

Macroprudential policy tools employed with the purpose of taming housing market boom-busts can target specifically the financial institutions lending for home purchases (Hartmann 2015). Instruments in this category include dynamic provisioning, which is a prominent measure due to its certain special features. There are other tools in the category, too, and they are mainly related to capital regulation.

3.2.1 Dynamic Provisioning

The so-called dynamic provisioning practice is an important example of the lender-based macroprudential tools used for housing market regulation (see for example Vandenbussche et al. 2015 and Crowe et al. 2013). Dynamic provisioning is a rules-based scheme requiring banks to make larger provisions, reserves for possible loan losses, relative to current performance of the loans in the upswing and then draw down the buffers built this way in the downturn by provisioning less than the non-performance rates in these conditions would suggest (BoE 2011). This is done by adding a countercyclical general component to the traditional loan-specific provision. Figure 4 provides a stylized illustration of the use of dynamic provisioning.

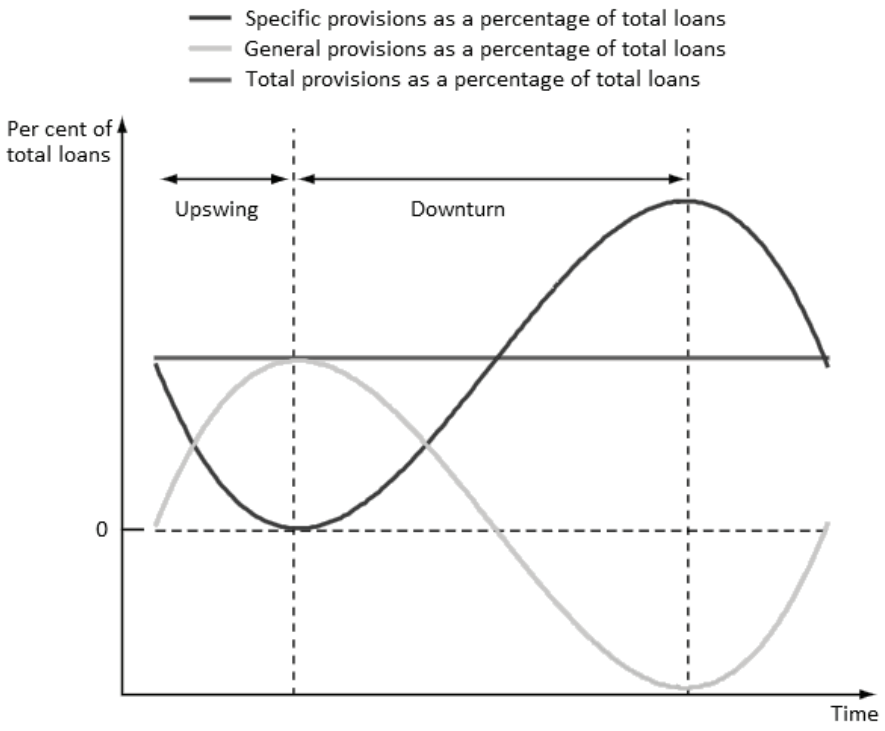

Figure 4: Stylized Illustration of Dynamic Provisioning Scheme (source: BoE 2009, p. 8)

Mahapatra (2012), for example, argues that the standard provisioning practices have important shortcomings and a shift from the traditional scheme towards the dynamic one is needed to address these issues. The principal deficient feature in the traditional provisioning practices is the intrinsic procyclicality due to linking the size of provisions to the current performance rates. In the upswing, non-performing loans are few and far between, and thus the provisions tend to be small, too. And of course, the opposite is true for the downturn.

The mechanism through which the dynamic provisioning scheme is supposed to alleviate the procyclicality problem is the independence of the general or cycle-specific provision component of the current performance rates. By forcing the banks to determine at least part of the total provisions based on long-run historical performance of certain types of loans and not the current state, in the boom phase, the provisions are much larger than the prevailing state of the loans would suggest. And symmetrically, when the cycle turns and the current-performance based provisioning would lead to excessive reserves, taking into account the long-run perspective results in more moderate provisioning, which is made possible by drawing down the buffers built in the upswing. This alleviates the credit crunch problems and contributes to allowing for flow of credit to be better maintained through bad times. (BoE 2009)

As discussed in Crowe et al. (2013), dynamic provisioning as a part of the macroprudential toolkit also has a unique advantage over many of the other macroprudential measures, that is, the problem of pushing on a string is not present. This is due to the fact that dynamic provisioning, not being subject to minimums, does not suffer from issues with non-binding constraints. It can hence be used in situations in which, say, capital regulation is ineffective, such as in busts when capital ratios of banks are already higher than required. As a result, the tool retains its usefulness in promoting countercyclicality also beyond the boom period.

But there are disadvantages, too, not common with some of the other tools. Most notably, while dynamic provisioning can be fairly successful in increasing the resilience of the system against busts and also address procyclicality during downturns, it is not a tool designed to contribute much to prevention of credit booms in the first place. Although larger provisions are required in the boom phase, the cost of credit is not significantly increased by them and the often leverage-driven boom is thus not stopped either. (Crowe et al. 2013)

As for empirical evidence on dynamic provisioning, there is some available particularly from Spain. Spanish authorities first introduced dynamic provisioning scheme already in 2000

and so have a rather long history in the use of the tool in comparison with typical country experiences with macroprudential policy. Spain thus works as a case example for studying the effectiveness of the measure. The evidence from Spain is in line with the theoretical advantages and shortcomings of the tool; while the buffer built worked to cushion the blow in the bust phase of the recent financial crisis, the provisioning practice did little to prevent credit expansion (BoE 2011, Crowe et al. 2013). The problem is well illustrated by the fact that the private credit to GDP ratio more than doubled between 2000 and 2008 in Spain despite its dynamic provisioning scheme (BoE 2009).

3.2.2 Other Pertinent Measures

Besides dynamic provisioning, other lender-based macroprudential tools are also available for housing market regulation. Essentially, countercyclical capital requirements and adjustments in risk weights in counting the required capital are used. (Crowe et al. 2013)

Countercyclical capital requirements can potentially alleviate the adverse consequences of the credit expansion typically coinciding with house price booms but important caveats in employing the tool in this context are present as well. At best, the use of the instrument can both limit credit availability in booms and build up buffers for busts, diminishing the probability and severity of the detrimental credit crunch phase (BoE 2011). However, there are multiple shortcomings if the tool is employed in its simple form. For instance, if proper risk weights are not applied, the regulation may result in exposures building up in certain types of loans with the possibility of even increasing aggregate risk (Crowe et al. 2013). Moreover, this tool is particularly prone to the problem of pushing on a string in certain circumstances, having no effect as the regulatory constraints may not always be binding (Aikman et al. 2013). This is especially the case in the credit crunch often associated with the bust phase of the house price bubble.

Partly as a solution especially to the first-mentioned problem with countercyclical capital requirements, risk weights in determining the adequate capital can be developed as well. The idea is to take into account the fact that loans differ in terms of their riskiness and incorporate this notion to the capital requirements. The resulting risk weights can also be varied in time to address observed risks building up in certain sectors. While this is theoretically a sound solution, many practical limitations persist. For instance, it is deemed difficult to determine the risk weights in enough detail to prevent the regulation from being circumvented, say,

through off-balance sheet activities or non-bank intermediaries. In addition, sometimes this type of stricter capital regulation only serves to invite foreign competition to the market with a competitive advantage, not being subject to local capital requirements. (Crowe et al. 2013)

Regarding empirical evidence on the policy tools having to do with capital regulation, not only is it still limited but the outcomes appear somewhat mixed, too. Crowe et al. (2013) provide a stocktaking of country experiences in employing capital regulation as a macroprudential tool in the real estate context. According to the authors, although certain countries, such as Poland, have been at least to some extent successful in stopping credit growth with these tools, many, including Bulgaria, Croatia and Ukraine, have failed, too. Furthermore, even when successful in mitigating credit expansion in certain groups of loans, the attempts have only had limited effect on the overall credit growth, possibly suggesting that the problem with shifting risk from one type of exposure to another is strongly present.

3.3 Borrower-Based Instruments

In addition to targeting lenders, macroprudential policy tools employed in housing markets can be borrower-based. In this category, setting a limit on loan-to-value ratio is a tool that has been particularly widely employed and studied. The auxiliary tools targeting borrowers are closely related to the LTV cap in the sense that they are typically limits on maximum loan amount, too, but focus on other factors like household wealth instead of collateral value. (Crowe et al. 2013)

3.3.1 Loan-to-Value Limits

The LTV limit aims at containing excessive leverage by simply limiting the mortgage size a household can take relative to the value of the house purchased. Typically, this maximum allowed mortgage-to-house-value ratio is set to somewhere close to 90 percent but country practices vary significantly. Equivalently, a 90 percent LTV cap would translate to a down payment requirement of 10 percent of the transaction value. Limiting the loan size this way has several potential stability benefits. (Crowe et al. 2013)

First, the LTV cap combats housing market disturbances by lowering the leverage ratio of credit-constrained households taking a new mortgage (Eerola 2016b). As Crowe et al. (2013) argue, the lower leverage ratio then leads to a greater house price drop being required to lead

to negative equity for a borrower. This state is associated with, among other issues, higher structural unemployment since households in the negative equity territory may be reluctant or unable to sell their houses and take advantage of job opportunities elsewhere. Moreover, the smaller incidence of negative equity will cause fewer defaults in the downswing as more households unable to cope with their mortgage expenses can pay the debt by selling their house as a last resort. And in case a default occurs anyway, the recovery ratio will be higher when the household is more moderately leveraged.

Second, in addition to lowering the leverage ratio of credit-constrained households, the LTV cap may dampen housing market cycles by affecting demand, and, importantly, this affects all of the households in the economy, including those that are not credit-constrained. In particular, the introduction of the LTV limit will reduce the number of borrowers eligible for a mortgage given the price, so that demand for housing will generally decrease. (Crowe et al. 2013) Eerola (2016b) also notes that one potential transmission channel is formed by the resulting changes in house price expectations.

In comparison with the lender-based approach, limiting the LTV ratio has benefits and shortcomings of its own as a macroprudential policy instrument. From a circumvention propensity point of view, the LTV cap has some prominent features. A central advantage of the instrument is that being borrower-based, it is significantly more difficult to arbitrage away by cross-border circumvention. If the authorities impose stricter capital regulation for domestic banks, it may be the case that foreign firms can enter the market with competitive advantage due to their balance sheets not being subject to local rules. However, unlike with instruments affecting lenders, when regulation concerns borrowers, the rules typically apply to both domestic and foreign firms in the market (BoE 2011). That is, while the authorities cannot commonly regulate the balance sheets of foreign banks, they can regulate lending practices concerning consumers in their jurisdiction. On the other hand, even though cross-border circumvention is not so much an issue with the LTV limit, other types of regulatory arbitrage opportunities may be more relevant than with the lender-based tools. For instance, in the US, during the recent housing boom, households often took multiple loans to get around the LTV regulation. (Crowe et al. 2013)

The abovementioned properties of the LTV cap have some important implications for their usability in international context. In particular, international considerations play a central role in the euro area, in which banks can offer cross-border services and open branches in other member countries (BoE 2009). Moreover, as Hartmann (2015) reports, housing market

developments have varied significantly across the member countries in the 2000s. This implies that there are no one-size-fits-all policy measures for housing market regulation at the union level but rather each region requires its own policymaking. In these conditions when cross-border spillovers are a notable issue and yet different policy actions are required in different countries, many lender-based macroprudential measures have important shortcomings. However, borrower-based measures like the LTV limit may provide a solution to this problem since the regulation is potentially both effective locally regardless of foreign firms and has relatively limited spillover effects to housing markets in other member countries. Se (2013), too, speaks for the suitability of the LTV limit for the euro area countries arguing similarly that the benefits include the ability to take into account the unique country environments.

Yet, regardless of the benefits in use concerning international considerations, locally the LTV limit may have problematic social effects (Crowe et al. 2013). The commonly faced issue with the LTV cap is that young households buying their first homes often find it difficult to satisfy the conditions and hence acquire home ownership (Duca et al. 2010). Not only are these consequences often against the general societal preferences (BoE 2011) but, as Crowe et al. (2013) point out, the fact that the poorer individuals are hurt by the regulation may also create obstacles for proper implementation since political pressures tend to increase the risk of inaction. Moreover, the distortions created may prove difficult to correct; Duca et al. (2010) note that, in some cases, when the government has promoted home ownership among the young households by relaxing the LTV limit in targeted areas, house prices have been driven up as an unintended consequence.

As regards empirical evidence on the use of the LTV cap, some promising results have been obtained although these findings remain tentative due to the limited research on the subject (Crowe et al. 2013). For example, Igan and Kang (2011) find that tightening the LTV limit is associated with a decline in house price appreciation and transaction activity in their empirical analysis of Korean experience on this tool[9]. Moreover, Crowe et al. (2013) provide a back-of-the-envelope type calculation suggesting a positive relationship between the

[9] It is worth noting, as in Eerola (2016b), that since the Korean authorities actively used the policy tool in the sense that they made the decision to tighten the LTV cap, it may well be that the observed results are due to endogeneity of policy change. In other words, it might be the case that a tighter LTV cap was introduced as a result of an exceptionally high house price appreciation rate that was bound to decrease regardless of policy actions. However, the endogeneity problem is mainly limited to Asia-Pacific region where, as Kuttner and Shim (2012) point out, the LTV ratios have been varied in an effort to curb housing market excesses. Policymakers elsewhere have typically not actively used these tools but instead, the LTV ratio has been set and it has remained constant regardless of conditions.

maximum allowed LTV ratio and house price appreciation. Figure 5 shows this simple cross-section of house price appreciations and the LTV limits between 2000 and 2007 in 21 countries. However, it is in order to note that results like these are mere suggestive correlations rather than causal links. Two issues complicate the analysis. First, experience on the use of the LTV cap is still limited. Second, national practices in how the tool is actually employed are numerous and so the data are not always comparable. For instance, many countries only have guideline LTV caps that are not compulsory for banks to follow. (Crowe et al. 2013)

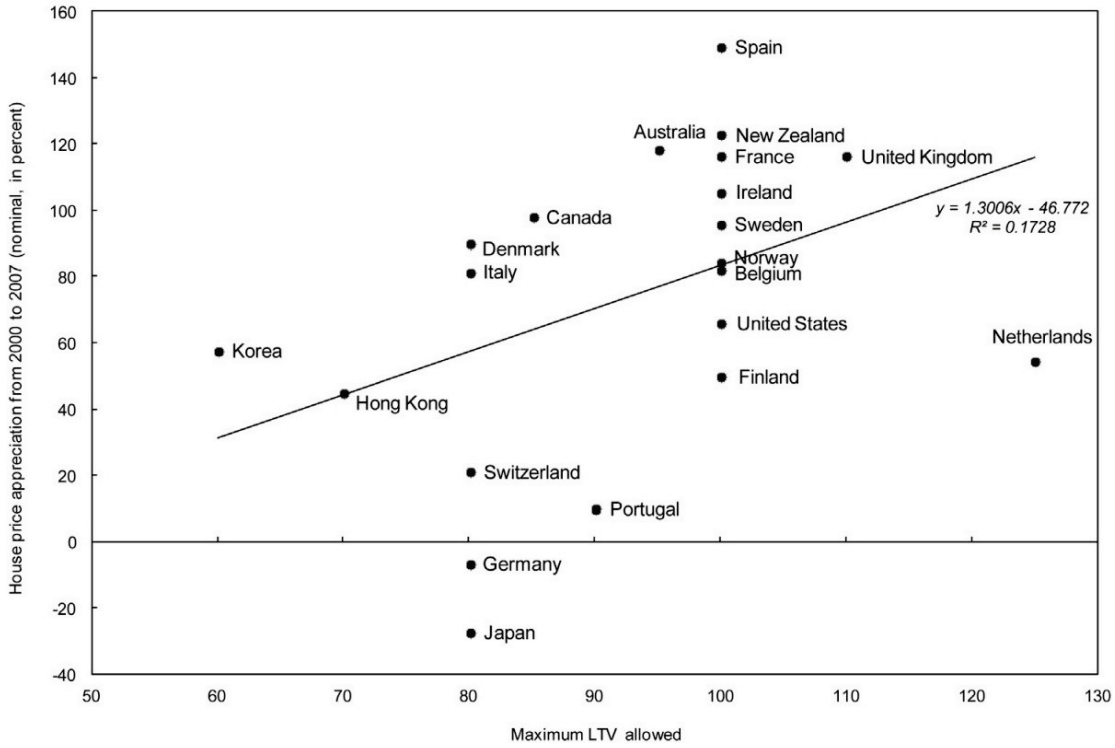

Figure 5: House Price Developments and LTV Caps (source: Crowe et al. 2013, p. 316)

3.3.2 Auxiliary Instruments

Other central borrower-based macroprudential tools used for addressing housing market issues are debt-to-income and debt-service-to-income limits. The use of the DTI cap considers other loans besides the mortgage as well, and relates these to the household income in determining housing loan eligibility (BoE 2011). The DSTI limit, in turn, focuses on total debt service expenses, including debt amortization and interest rate payments, that the household is responsible for periodically.

At first glance, the other borrower-based tools appear rather similar to the LTV cap but, in fact, the mechanisms through which the tools work are quite different. Instead of avoiding problems related to negative equity territory resulting from house price changes, the DTI and DSTI caps consider the household income level sufficiency for the loan in question. (Crowe et al. 2013) The DSTI limit especially is designed to decrease the household vulnerability to changes in the interest rate or their own income level, increasing the probability that debt service expenses are manageable (Putkuri and Vauhkonen 2012). In other words, with a sufficiently low DSTI limit, households can manage their payment schedules even if they experience some variation in their income or mortgage interest rate.

The DTI and DSTI limits have certain relevant advantages and weaknesses compared to the LTV cap. As discussed in Eerola (2016b) one of the key strengths with the tools considering household income instead of the collateral value is that credit is not directly allowed to grow with house prices in booms, as is the case with limiting the LTV ratio. Hence, the DTI and DSTI caps may better serve the policy goal of promoting procyclicality in upswings. The potential problems, in turn, have to do with the fact that other debt or debt service expenses besides the mortgage are considered. In Hong Kong, for example, the supervisors employing this type of approach had to rely on borrower self-reporting in the absence of complete data on debt obligations and often faced problems with borrowers leaving some of their debt unreported (Crowe et al. 2013).

As for empirical evidence on the DTI and DSTI limits, mainly cross-country evidence has been provided on the effectiveness of these tools, and the results appear somewhat mixed (Eerola 2016b). For instance, Kuttner and Shim (2012) find that the DSTI cap is associated with dampening credit growth. Lim et al. (2011) also document a correlation between a decrease in loan stock growth and the use of the DTI cap but not between house price appreciation and the policy action. Vandenbusshe et al. (2015), in turn, do not find significant association between the policy variables and the use of the DTI measure. In addition, Igan and Kang (2011) use within-country data for Korea and find that reductions in the DTI limit are followed by a house price appreciation rate decline, but, again, the policy endogeneity issues complicate the interpretation of these results.

4. MACROPRUDENTIAL POLICY IN FINNISH HOUSING MARKETS

4.1 Relevant Characteristic Features of Local Financial System

From the perspective of macroprudential policy in housing markets, there are several characteristic features of the Finnish financial system that are particularly relevant. Three such properties appear to be stressed in assessments regarding the subject, such as in Putkuri (2016). First, dwellings constitute a particularly significant proportion of the total asset base of households, that is, in Finland, housing is even by international comparison an important type of storage of wealth. Second, debt-financed owner-occupancy is a relatively common form of living for Finns. Third, lending for housing is highly concentrated on three largest banks, two of which have direct interlinkages to the Nordic banking sector, too.

As illustrated in Figure 6, dwellings are by far the single largest asset type in the total assets of Finnish households and, as Putkuri (2016) notes, the composition as a whole has remained by and large unchanged during the new millennium. The importance of housing as a storage of wealth for households results in their high exposure to house price developments, which, in turn, highlights the effect housing market developments have on, say, consumption in Finland. Schaumann (2012) provides an example of a transmission mechanism through which exposure to house prices may affect private consumption. Since houses are typically used as collateral, if house prices decrease, the collateral values decrease as well. In this situation, households may find it more difficult to obtain, for example, consumer or automobile credit and thus cannot consume as much as before. This very relationship between house prices and consumption is also confirmed by empirical work concerning Finland (Oikarinen 2009).

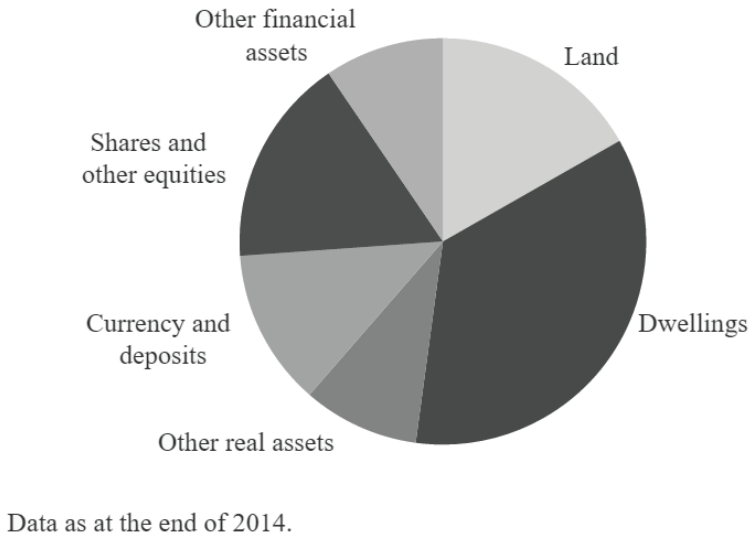

Figure 6: Components of Asset Base of Finnish Households (source: Putkuri 2016, p. 7)

Moreover, one of the key factors behind dwellings ranking as the number one asset type among households in Finland, namely, the relatively small amount of financial assets, might lead to further vulnerability. Since financial assets play a minor role in the Finnish household asset base, especially by international comparison[10] (Putkuri 2016), household consumption is less resilient to financial distress. As Mäki-Fränti (2015) argues, having a small proportion of their total assets in liquid form, such as corporate equity, the Finnish households can only finance their expenditures for a little time if main income sources are suddenly lost. Put differently, financial assets are thought to provide a cushion against unexpected changes in income level.

Closely related, debt-financed owner-occupancy is a popular form of living. Schaumann (2012, p. 5) reports that, in 2009, for example, the proportion of the Finnish population that were owner-occupiers and had a housing loan was approximately 44 percent whereas the equivalent figure for the euro area as a whole was only 28 percent. Notably, while owner-occupancy as such seemed not to be much more common in Finland at 74 percent than it was in other euro area countries at 72 percent, the incidence of having a housing loan in addition to this living form was, as noted above. And as with all leverage, having a mortgage amplifies the exposure to housing market developments storing wealth in real estate inherently holds. Furthermore, according to the BoF (2016b) statistics, the vast majority of

[10] It is important to note, however, that the insignificance of financial assets in the Finnish household asset base in comparison with many other countries is partly explained by the local pension system. In Finland, the statutory pension contributions are categorized as assets belonging to employee pension funds whereas in several other countries pension saving is voluntary and the related financial assets are hence classified as belonging to households. (Putkuri 2016)

loans to Finnish households is linked to Euribor interest rates or the own reference rates of banks that, too, follow closely the same path. This leads to the system reacting to changes in the key ECB interest rates relatively quickly and strongly compared to other euro area countries, where such linking is less common (Putkuri and Savolainen 2016).

A noteworthy resulting feature from the popularity of debt-financed owner-occupancy in the Finnish system is the relevance of housing loans in total lending. As Putkuri (2016) notes, in the early 2016, the stock of housing loans constituted nearly half of the euro-denominated loans Finnish credit institutions had granted to households and non-financial corporations in total. Therefore, the credit institutions are highly dependent on functioning of housing markets through the importance of housing loans in their portfolios.

Another clearly distinguishable characteristic of the Finnish financial system is the banking sector concentration, particularly in the case of housing loans. According to Putkuri (2016), three of the largest banks, namely, Op Group, Nordea Bank Finland and Danske Bank, account for more than 60 percent of total lending in Finland. Furthermore, when only mortgages are considered, the same institutions held over 80 percent of the total stock at the end of 2015, as shown in Figure 7. IMF (2012), among other observes, voices its concern over the high concentration, noting that it might increase contagion risks that the banking sector in Finland relies so heavily on a few systemically important institutions.

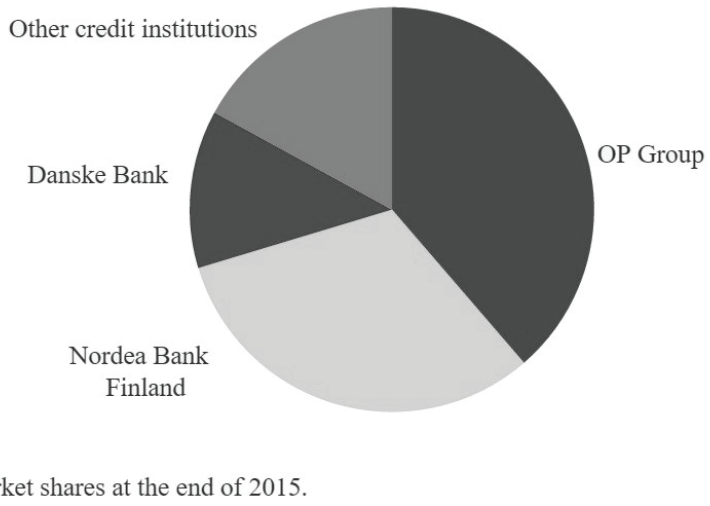

Figure 7: Market Shares of Mortgage Lending for Different Banks in Finland (source: Putkuri 2016, p. 10)

A related source of risk in the banking sector in Finland is the fact that two of the three most important banks, Danske Bank and Nordea Bank Finland, are subsidiaries of parent

institutions headquartered in other Nordic Countries (Koskinen et al. 2016). This causes two potential major issues from a Finnish point of view. First of all, not only are both of these banks outside the full reach of the Finnish macroprudential authorities due to their headquarters being in Denmark and Sweden, respectively, but the home countries are also outside the European banking union (IMF 2015). Thus, the Europe-level regulation does not automatically apply to the banks either. Second of all, cross-border contagion risk is particularly severe since there are only a few highly systemically important banks in Nordic countries taken together. Table 2 provides information on large banks in Norway, Sweden, Finland and Denmark, showing that both Danske Bank and Nordea hold large market shares in all of the other Nordic countries as well. Therefore, as discussed in Koskinen et al. (2016), problems in one of these countries could easily spread through banking interlinkages to the other countries, too[11].

Table 2: Market Shares of Large Banks in Nordic Countries (adapted from: Koskinen et al. 2016, p. 5)

Market shares, %

	Norway		Sweden		Finland		Denmark	
	Loans	Deposits	Loans	Deposits	Loans	Deposits	Loans	Deposits
Danske Bank	5.1	5.0	4.7	3.9	9.8	11.9	26.5	27.1
DNB	29.5	46.7	0.5	0.7	-	-	-	-
Handelsbanken	5.1	3.0	22.0	19.0	5.8	3.4	-	-
Nordea	13.5	12.5	13.6	14.6	28.8	28.7	17.6	31.2
OP Group	-	-	-	-	34.2	36.4	-	-
SEB	-	-	14.3	15.4	-	-	-	-
Swedbank	-	-	22.2	19.9	-	-	-	-
Total	**53.2**	**67.2**	**77.4**	**73.5**	**78.6**	**80.4**	**44.1**	**58.3**

[11] While outside the scope of this paper, the contagion risks present imply that the situation in other Nordic countries may be of key relevance also for the Finnish economy. The interested reader may refer to Schaumann (2012) for a comprehensive discussion on the systems of other Nordic countries from the perspective of housing markets and household debt.

4.2 Recent Developments

4.2.1 House Prices

Figure 8 provides the quarterly real prices of dwellings in Finland from 1988 to 2016. Undeniably, the single most important event visible in the figure is the crisis in the early 1990s[12] and the bubble preceding it. House prices appreciated sharply during the late 1980s until the burst of the bubble that resulted in an equally sharp decrease in house prices, followed by a severe systemic banking crisis in the early 1990s (Crowe et al. 2013). The resulting recession was a particularly severe one, with the peak-to-trough output decline of 14 percent (Claessens et al. 2009). In fact, the economic contraction in Finland from 1991 to 1993 is deemed the deepest in any industrialized country since the 1930s (Gorodnichenko et al. 2012).

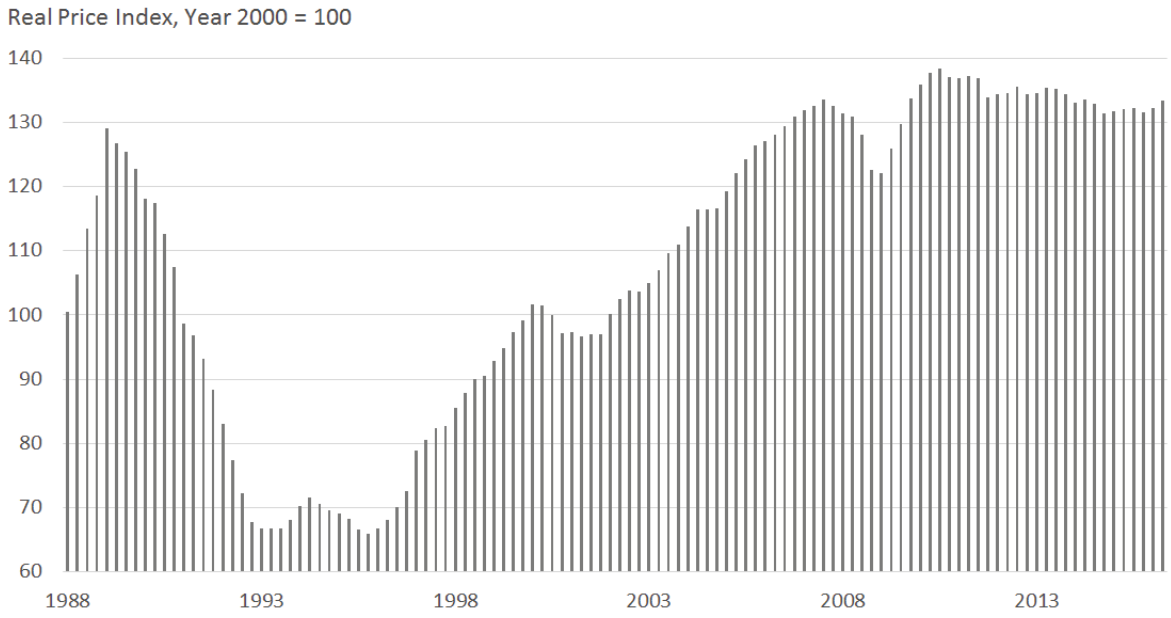

Figure 8: Quarterly Real House Prices of Dwellings in Finland (data source: Statistics Finland 2016)

After the recession, from mid-1990s onwards, the real house prices appreciated more or less steadily until the recent financial crisis began to show in Finland, too, in 2007. However, as Figure 9 illustrates, by international comparison the Finnish house prices did not increase extremely strongly in the decade preceding the recent financial crisis. Importantly, this is so

[12] See for example Honkapohja and Koskela (1999) for a thorough analysis of this crisis and its implications for the Finnish economy, to which the brief description here, arguably from a narrow perspective, cannot possibly do justice.

even though Finland had experienced the burst of the house price bubble in the early 1990s unlike many other countries. In other words, despite the fact that house prices in Finland were at a very low level in the mid-1990s compared to, say, the average level in 1988–2016, the appreciation between 1997 and 2007 was fairly modest compared to international experiences. As is clear, there are various reasons behind the observed differences across countries but to name a few central ones, for instance, Kajanoja (2012) mentiones structural differences in financing house purchases and the ability of the supply of houses to respond to increased demand.

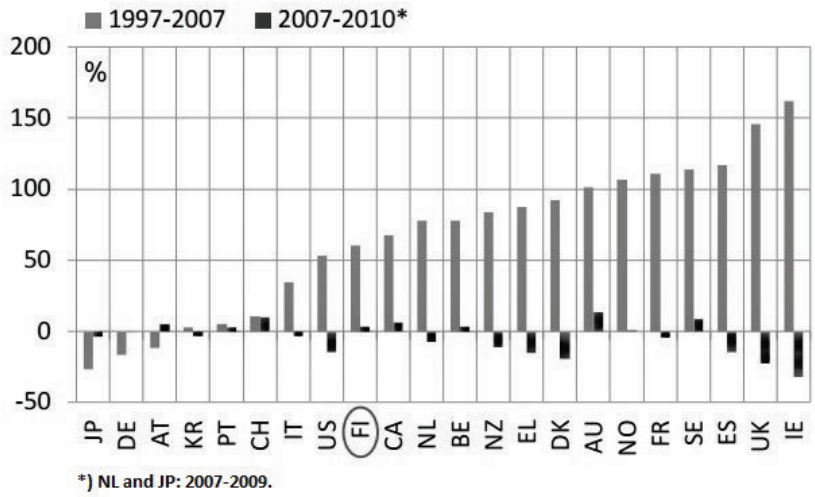

Figure 9: Real House Price Appreciation in Different Countries (adapted from: Kajanoja 2012, p. 5)

Concerning the Finnish house price development, the time after the beginning of the global financial crisis in 2007 can be viewed consisting of two different distinct periods, the crisis and the post-crisis phase. Likely due to the modest real house price appreciation in 1997–2007 in Finland, the depreciation that globally came along with the crisis was also relatively mild for the Finnish house prices. From their peak in the late 2007, the real house prices only depreciated for six consecutive quarters in Finland without experiencing any extreme downward movements either, unlike in the early 1990s, as shown in Figure 8. And when examining the crisis period as a whole, the years 2007–2010, as in Figure 9, the price development in real terms was, in fact, somewhat positive in Finland in contrast to the majority of other countries examined. In the post-crisis period during the 2010s, in turn, the Finnish real house prices have had a moderate downward trend. The trend has nonetheless been almost negligible compared to the swings in the 1990s and the 2000s, and no notable depreciation even cumulatively has occurred. To summarize, regarding the real house price

developments, the 2010s has so far been a significantly more stable period of time than the preceding decades in Finland.

From a macroprudential perspective, it would be particularly interesting to determine whether house prices are overvalued, that is, whether a bubble is building up and the prices are not at a sustainable level. Many frameworks for assessing the relation of house prices to their fundamentals exist. The possible overvaluation in Finnish house prices has been commonly assessed by simply comparing house price and income developments, *inter alia* (Kajanoja et al. 2013). Among the more sophisticated methods, Oikarinen (2010) provides an empirical study of the Finnish house prices prior to the recent financial crisis. This study is conducted employing the theoretical framework of equaling rental level to the user cost of housing by Poterba (1984). According to Kajanoja et al. (2013), neither the simple assessments nor empirical evidence based on sound theoretical modelling suggest significant overvaluation in the Finnish house prices for periods assessed. IMF (2015, p. 13), too, concludes that "standard metrics suggest that average house prices are broadly in line with fundamentals" in Finland.

However, it is important to note that results of this type should be interpreted with caution as high level of uncertainty is necessarily involved in any overvaluation consideration (Kajanoja et al. 2013). By definition, identification of bubbles is problematic and the task is thus at least as difficult as it is important. Aside from the obvious problems with simply relating house prices to, say, income level, such as the incomplete explanatory power the latter has over the former even in theory, the more sophisticated alternatives have their own issues as well. Oikarinen (2010), for instance, reviews several shortcomings in the application of the user cost framework in empirical work. Kuttner and Shim (2012) also point out that in addition to practical issues with the model, including inability to measure all the relevant variables, data limitations often complicate the applicability in practice. Therefore, based on existing evidence, it is difficult to say anything for certain about the sustainability of the current price level.

4.2.2 Credit Related to Housing

Along with house prices, related debt, too, plays a crucial role from the macroprudential perspective. Although there is no clear-cut manner to determine whether debt borne by households is at a sustainable level, two indicators employed for the purpose in housing

market context appear to be of particular interest (see for example Putkuri 2015). First, the relation of household loan stock to income can be considered on aggregate level. Second, the distribution of this debt burden to different household types is often examined. Yet another commonly employed indicator is the incidence of defaults on housing loans (see for example Kajanoja 2012).

In contrast to house prices, the crisis in the 1990s was not associated with dramatic household debt developments, at least using the traditional indicators, but rather, the obviously visible housing market related credit phenomenon in the recent decades in Finland appears to be the increase in debt relative to disposable income in the new millennium. Indeed, as shown in Figure 10, while households got somewhat more leveraged in the build-up of the crisis during the late 1980s, in terms of debt to their income, the leverage ratios did not skyrocket. Moreover, the deleveraging by households following the crisis during the early 1990s was not particularly drastic either. From the second half of the 1990s onwards, in turn, general indebtedness has increased significantly among the Finnish households.

Figure 10: Yearly Finnish Housing Debt Development (source: Putkuri 2016, p. 4)

To better understand the experienced development and its implications, it is useful to look at the household debt composition and changes in it. This type of examination, implemented as well in Figure 10, reveals that especially the housing-loan-to-disposable-income ratio has increased significantly. Furthermore, at the same time as the housing debt directly to households has grown, households have indirectly become more indebted through loans for housing companies, that in practice, increase household exposure, too. But in contrast, all other debt borne by households relative to their income is at a lower level now than it was

in the 1980s and the 1990s. All of this further highlights the importance of housing markets for the Finnish financial system. (Putkuri 2016)

There are several factors behind the observed housing credit growth in the 2000s in Finland. Kajanoja (2012), for instance, notes that demand for housing has been fuelled by particularly low interest rate level on new mortgages by international comparison. This , in turn, resulted from the relatively quick reaction of Finnish housing loan interest rates to the ECB policy rate decisions due to being typically linked to them. Figure 11 illustrates this interest rate development in the new millennium. Moreover, as discussed in Putkuri (2016), both average loan sizes and maturities have increased, especially during the 2000s.

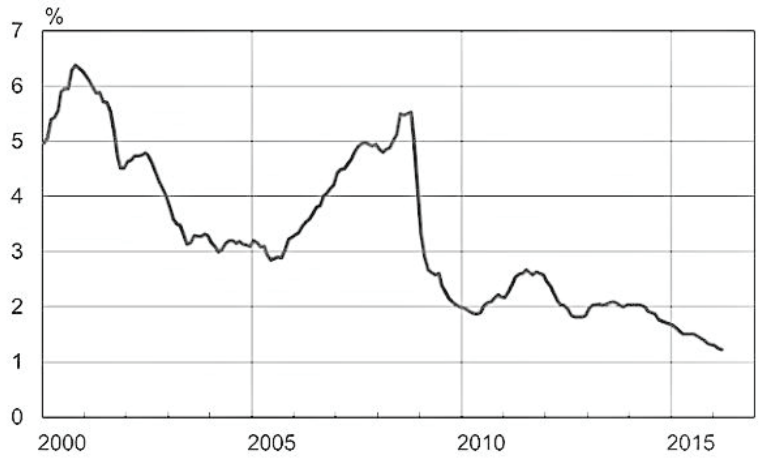

Figure 11: Average Interest Rate on New Housing Loans in Finland (source: Eerola 2016a, p. 4)

However, relative to other similar economies, Finnish households are fairly moderately indebted. For instance, as shown in Figure 12, the ratio of all household debt to disposable annual income in Finland has, on average, been very close to the equivalent of the euro area as a whole between 2004 and 2014. Comparisons to many developed countries outside Europe, too, show that Finnish household indebtedness appears not be particularly high. For example, as Kajanoja (2012) notes, in the US, Japan and Canada, the debt relative to disposable income figures are higher than they are in Finland. Furthermore, compared to households in other Nordic countries, the Finnish households appear, in fact, very little indebted, having more or less constantly had 50 to 150 percentage points less debt relative to disposable income during the 2000s, depending on the country in question[13] (IMF 2015).

[13] Denmark, in particular, is a country where households are highly indebted, with the ratio of debt to disposable income having constantly exceeded 250 percent in the 2010s, as Figure 12 shows. One of the many reasons behind other Nordic countries apart from Finland having such high household indebtedness is

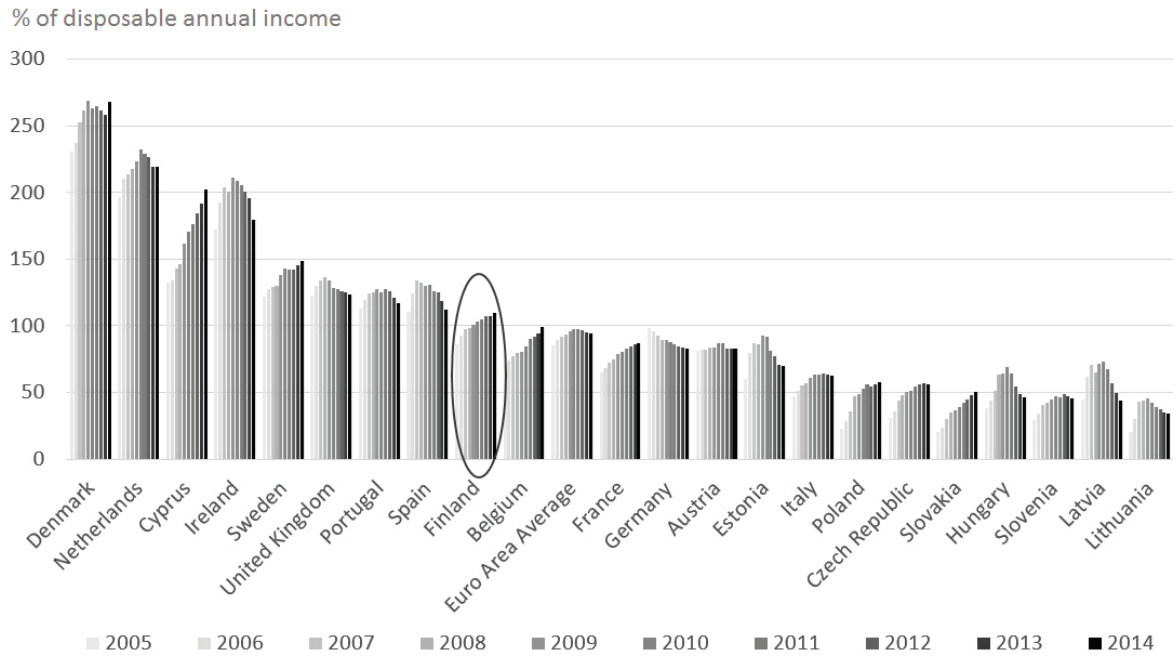

Figure 12: Household Debt Relative to Disposable Income in Different Countries (data source: Eurostat 2016)

Especially from the macroprudential point of view, in addition to the general indebtedness, it is important, too, how the debt is distributed among households (Eerola 2016b). This is due to the fact that same levels of aggregate indebtedness between countries can differ significantly, say, in their potential for actually causing loan losses for credit institutions. For example, if most of the debt in the economy was borne by low-income households that hence had high debt-to-disposable-income ratios, the setup would arguably be significantly riskier than in case the debt burden was shared equally in the sense that everyone had the same ratio of loan to their income level. The underlying problem with heavily indebted households is that since they have very little financial leeway, they are highly prone to not being able to manage their loan expenses if faced with any interferences in their regular income stream. Moreover, this interference sensitivity is amplified by the fact that housing loans in Finland are so commonly tied to variable interest rates (Putkuri 2016).

Figure 13 plots the data on distribution of total loan stock by groups of households with varying debt-to-disposable-income ratios for three points in time in Finland. While no drastic difference is visible between the years 2010 and 2014, the distinction between the early 2000s and the 2010s in general is quite clear. For instance, the proportion of the total debt borne by households with more than 400 percent debt-to-disposable-income ratio increased

the use of mortgages that are not amortized at all, which constitute half of the Danish housing loans and close to one fifth of the loans in both Sweden and Norway (Schaumann 2012).

notably during the ten or so years. In 2002, merely 11 percent of the total loan stock was borne by this group, whereas the figure peaked at over 28 percent in 2010, remaining still above 26 percent despite declining moderately by 2014, from which the most recent data are available (Putkuri 2016). This somewhat drastic shift of more debt burden to the heavily indebted households in the last ten or so years may at least partly be explained by the observation by Kajanoja (2012), among others, that recently young households, in particular, have taken large mortgages.

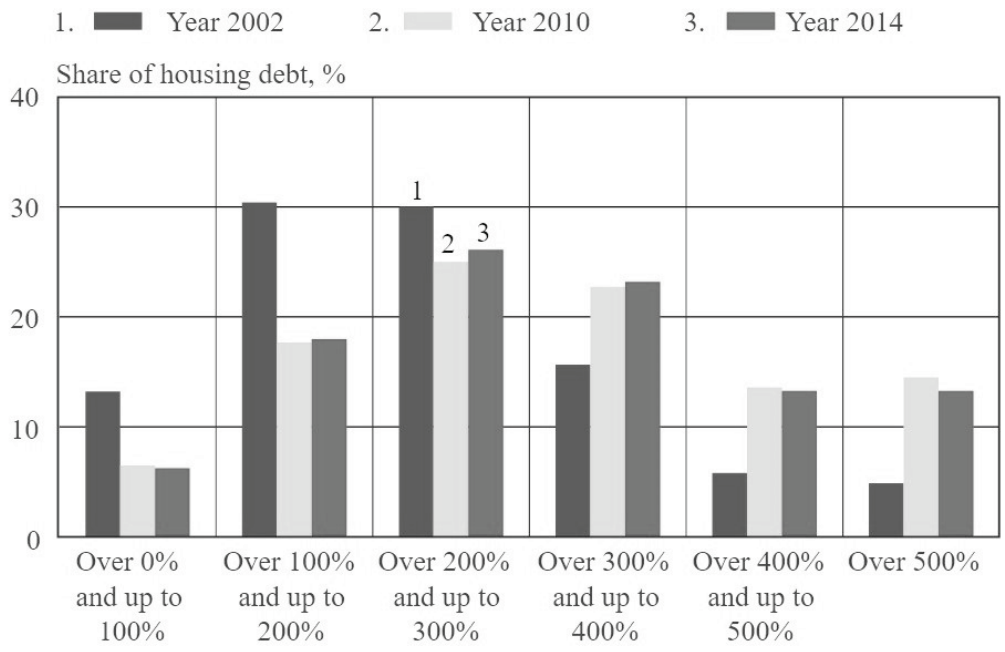

Figure 13: Housing-Related Debt Distribution in 2002, 2010 and 2014 (source: Putkuri 2016, p. 3)

Along with all the other types of issues unsustainable household credit levels can cause, such as immediate contraction in economic activity in bad times through lack of financial leeway, another quite obvious source of problems is the increased probability of actually defaulting on the loans. Of course, many other factors besides indebtedness affect default probability, too, but due to their close relationship, it is appropriate to consider historical loan losses when discussing indebtedness-related issues. Yet, a factor complicating analyzing defaults even descriptively is that loan loss data are not typically publicly available (Jokivuolle et al. 2015).

However, some publications on the subject showing data from Finland are available, such as Kajanoja (2012). The data, plotted in Figure 14 for the years 1980–2010, show the loan losses both in absolute terms and relative to the total loan stock. Perhaps the most important take-away here is that, historically, the losses from household loans have remained mild in Finland, as noted in Putkuri and Vauhkonen (2012), too. For instance, in the crisis years

from the late 1980s to the early 1990s, the losses in absolute terms increased significantly but relative to the total household loan stock remained well below one percent even at the worst phase. Another point to make based on these data is that while household indebtedness and loan losses appear to be correlated, for example the late 2000s with household debt-to-disposable-income ratios being at a very high level, as shown in Figure 10, were not associated with significant losses. This would suggest that, at least from the loan loss perspective, when assessing the sustainability of household debt, the traditional indicators, such as debt-to-disposable-income ratios should perhaps be complemented with others as well.

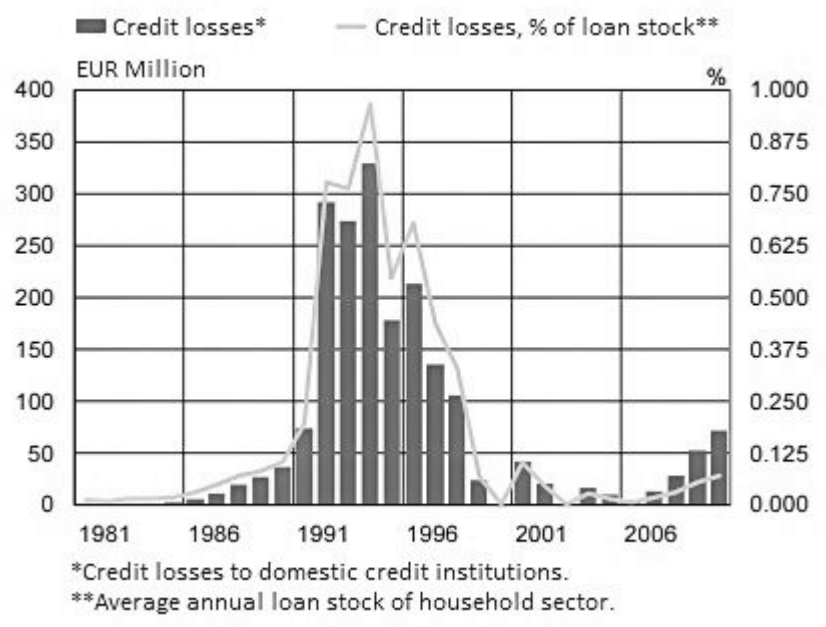

Figure 14: Loan Losses from Household Loans to Finnish Credit Institutions (adapted from: Kajanoja 2012, p. 23)

4.3 Regulatory Environment

4.3.1 Brief History and Current Setting

Before the recent financial crisis and even in the early 2010s, the macroprudential options for Finnish authorities to deal with housing market related risks were very limited, but the situation has improved significantly during the preceding few years. In fact, as Kauko (2016a) notes, macroprudential policy has not been conducted in its current form in Finland until the mid-2010s. But unlike before, many promising instruments that have been studied internationally have now been introduced in Finland, too.

Until the last few years, the FIN-FSA has not had the authority to actually mitigate risks arising from housing markets with lender-based measures (Putkuri and Vauhkonen 2012). Indeed, determining the macroprudential powers of the FIN-FSA has still been a work in progress in the 2010s, and some key features have only been agreed upon in the preceding couple of years (FIN-FSA 2016). As discussed in Putkuri and Vauhkonen (2012), regarding the lender-based measures, the limitations in the framework in place previously included lack of ability to set risk weights on housing loans or to employ countercyclical capital buffers.

A number of issues were present in the earlier setting concerning merely the risk weight aspect. At the time, for all credit institutions that applied the standard practice of determining capital requirements, loans with housing collateral had a constant risk weight of 35 percent, with the general requirement of holding 8 percent of capital of the total amount of risk-weighted receivables. What this meant in practice was that these institutions were required to hold 8 percent times 35 percent, that is, 2.8 percent capital of their housing loan stock. With the risk weight being fixed, the authority had no means to dampen credit booms in housing markets by imposing a higher risk weight for the sector and hence discouraging lending for housing. Moreover, alternatively, the credit institutions could also apply an Internal Ratings Based Approach (IRBA), as many larger banks in Finland have traditionally done. These institutions were not subject to the standard risk weights but employed their own default probability estimates based on historical data and determined capital ratios required in lending for housing on this basis. After the recent financial crisis, concerns have been voiced over procyclicality of procedures like these. (Putkuri and Vauhkonen 2012)

From 2014 on, risk-weight adjustment has been a part of the macroprudential toolkit in Finland. The authority can now increase risk weights on loans with housing collateral, and importantly, the novel regulation affects both institutions applying the standard practice and the ones employing some form of an IRBA. (FIN-FSA 2016) The ability to impose stricter risk weights on institutions not applying the standard practice is of particular relevance in Finland. As many large banks operating in the Finnish jurisdiction employ an IRBA, the ability to affect institutions regardless of their method of choice is crucial for the success of the regulation (Putkuri and Vauhkonen 2012). Furthermore, since the macroprudential regulation by the FIN-FSA reaches those credit institutions that apply an IRBA, too, the procyclicality issues related to the procedure can be addressed in the new setting.

Regarding the countercyclical capital buffers, this tool either was previously not at disposal for the FIN-FSA, and the new regulation entered into force as late as from the beginning of 2015. Currently the authority can impose an additional capital buffer ranging from 0 to 2.5 percent of total risk exposure amount on credit institutions. In other words, up to an extra 2.5 percent capital can be required from the credit institutions under certain pre-specified conditions, and the additional requirement must normally be met within 12 months of the decision. However, the FIN-FSA can also decide "on a stricter schedule on specific grounds." (FIN-FSA 2016)

Much like with the lender-based risks, the ability of the Finnish regulators to address risks related to excessive borrowing relative to the collateral value of the house purchased has traditionally been limited. Previously, as the legal framework did not allow the FIN-FSA to set binding requirements for banks on the LTV cap (Putkuri and Vauhkonen 2012), it could only issue a non-binding recommendation on a 90 percent maximum LTV ratio (Schaumann 2012). Not surprisingly, this measure, put to use in the early 2010, proved somewhat inefficient in practice. As discussed in Putkuri and Vauhkonen (2012), the banks continued to grant loans with higher LTV ratios than the recommended 90 percent. In fact, according to the FIN-FSA sample survey conducted in the late 2010, more than half of the new loans at the time were still granted with an LTV ratio above 90 percent. Given this issue in the regulatory framework in place previously, it is understandable that during the recent years, many observers have spoken for a reform, vesting the required powers in the authority for setting a binding maximum allowed LTV ratio (see for example IMF 2012 and Putkuri and Vauhkonen 2012)

In July 2016, this reform was implemented by replacing the merely recommended 90 percent maximum LTV ratio with a similar binding requirement. Under the new regulation, the maximum allowed LTV ratio is 90 percent, and the authority also reserves the right to lower this ratio by 10 percentage points to "restrict exceptional growth in financial stability risks." Moreover, there is an important exception in the standard 90 percent maximum LTV ratio: first-home purchases are allowed a higher ratio of 95 percent. (FIN-FSA 2016)

In contrast to the LTV limit, no direct regulation is in place for maximum allowed debt-to-income or debt-service-to-income ratios for Finnish households (FIN-FSA 2016). The FIN-FSA has, however, for some time now recommended that banks operating in Finland should take into account the ability of the household to manage the loan-related expenses. This is implemented by performing a household-specific stress test. The standard practice has been

to calculate the monthly interest rate payments employing the highest Euribor interest rate so far since the adoption of the euro, currently 5.5 percent, and check if the debt service expenses would still be at a sustainable level for the household in this scenario. (Putkuri and Vauhkonen 2012)

Since virtually the whole macroprudential toolkit of the FIN-FSA has been reformed during the preceding few years, with the latest major new features introduced just a few months ago at the time of writing, there is practically no experience on the use of the novel tools in the Finnish context and hence assessing their success is difficult, too. In fact, as Nier et al. (2011) report based on their country survey on the use of selected macroprudential tools, Finland has no experience at all in employing, say, the LTV ratio or countercyclical capital requirements prior to the reforms in the 2010s. But in time, especially if the tools are used actively, some interesting empirical results may be obtained from their success in Finland. For example, if the FIN-FSA exercises its right to sometimes lower the LTV ratio, these changes may create interesting research opportunities. As mentioned in Crowe et al. (2013), varying the LTV ratio may allow for better empirical settings for studying the effects of the limit on certain relevant indicators.

4.3.2 Future Prospects

A few potentially significant events from the macroprudential perspective are expected to take place in Finland in the late 2010s. Most importantly, a large financial institution, namely Nordea, has announced its plans to convert its Finnish subsidiary into a branch, which has an impact on how it is supervised (Kauko 2016b). Moreover, the tax treatment of interest payments is gradually altered until the year 2019 (Putkuri 2016).

As discussed in Kauko (2016b), it is reasonable to assume that the plan to convert the Finnish subsidiary of Nordea into a branch will have a multitude of implications for housing markets in Finland from the supervisory perspective, if implemented in its current form. The impact of the change in legal structure will moreover likely be of a significant magnitude since Nordea has a share of about one third of household loans in Finland. However, economics literature does not notably address the question of how market activities of subsidiaries and branches differ, and there are hardly any previous examples of a branch of a foreign bank having such systemically important role in any country even in the global scope. Yet, in the banking business the group structure generally matters, and in this case, this is definitely so

since Sweden is not part of the Single Supervisory Mechanism. This means that the supervision of the operations of Nordea in Finland will be moved beyond the scope of the banking union legislation, and after the merger the Swedish supervisory authority will take primary responsibility of macroprudential supervision of these operations. Hence, at this point it seems that the potential threats the possible conversion poses have to do with the lack of supervisory power the local authorities have in Finland afterwards.

One central concern in this category, voiced for example by IMF (2015), regards the ability of the Finnish authorities to access information pertaining to Nordea in case it will be supervised in Sweden. To be able to formulate macroprudential policy actions in Finland, it is clear that a view of the exposures of a bank having so large a market share is required. This emphasizes the importance of co-operation not only between Finnish and Swedish authorities but also between the macroprudential institutions in these two countries and at the European level.

Another potential threat of a similar type, noted by Kauko (2016b), is that along with the possible conversion, Nordea is shifted entirely outside the reach of the Single Resolution Mechanism since it will not be a bank residing in the banking union countries. Therefore, the assets of the Single Resolution Fund will not be available to it either but instead, the Swedish resolution fund will have to cover it in case of insolvency. The Swedish central bank Sveriges Riksbank (2016), too, points out that the conversion may increase the undertaking of Sweden in times of distress.

Finally, on the level of actual regulation applying to Nordea and, in particular, its operations in Finland after the possible merger, there are also relevant factors to be considered. After the conversion, for instance, affecting the risk weights of housing loans in determining the capital requirements of Nordea becomes more complicated. This is due to the fact that in the new setting, any changes in the IRBA models widely used for calculating risks to credit granted in Finland will need to be approved by the Swedish authority before they apply to Nordea. (Kauko 2016b)

Aside from the possible conversion of the Finnish subsidiary of Nordea into a branch, another important future prospect for housing markets in Finland from the macroprudential point of view is the upcoming gradual reduction in the tax deductibility of interest rate payments. By 2019 the interest rate tax deductibility is lowered from the earlier 100 percent to 25 percent (Putkuri 2016, p. 5). The reduction in the tax deductibility of interest rate

payments should, at least as modelled in the user-cost framework of Poterba (1984), reduce the attractiveness of owning a home versus renting one. Originally, the change in legislation was justified with social policy reasoning, that is, equalizing the tax treatment of home ownership and renting, instead of macroprudential grounds (Putkuri and Vauhkonen 2012, p. 6). But Putkuri (2016), for example, points out that the reform clearly has macroprudential implications, too. Two opposing potential effects have been identified. On one hand, interest rate expenses increase as a result of the change for those already having a mortgage, which may be an issue for heavily indebted households because of further limiting their financial leeway. On the other hand, in the long run, anticipating the higher loan expenses given the loan size, households might be willing to take smaller housing loans, which, in turn, may promote financial stability.

4.4 Towards Better Macroprudential Framework

4.4.1 Extending Macroprudential Toolkit

During the recent years, many novel powers have been vested in the Finnish macroprudential authority regarding housing market regulation, taking crucial steps towards allowing it to address financial stability threats arising from the sector. Yet, the work is by no means finished and it can be argued that some limitations persist in the set of tools currently at disposal. Due to the incomplete nature of the current regulatory practices, extending the set of macroprudential tools of the Finnish authorities might provide financial stability benefits for housing markets.

Although LTV caps have been recently introduced in Finland, which is widely deemed an important improvement in the macroprudential regulatory environment for housing markets, the perspective of the borrower-based regulation in place remains somewhat limited. This is due to the fact that limiting the maximum allowed LTV ratio aims to increase the house price drop needed to lead to household entering the negative equity territory, but the tool does nothing to address the potential issues related to changes in household income or loan service expenses. And because an increasingly large proportion of aggregate debt in Finland is borne by the heavily indebted households in terms of loan to their income level (Putkuri 2016), it seems worthwhile to explicitly consider the latter aspect, financial leeway, too, in determining mortgage eligibility.

Fortunately, there is already available a relatively established macroprudential instrument for the task not yet in use in Finland, namely, the debt-service-to-income limit. Complementing the borrower-based toolkit with a maximum allowed DSTI ratio addresses the issue of lack of financial leeway directly by considering the entire household debt service expenses relative to its income.

There are, however, negative country experiences, too, showing potential implementation challenges that would likely be present in the Finnish system in its current form as well. In particular, the data limitations regarding household debt apply to the Finnish setting. In Finland either, there are no data on total household or consumer level loans, so the authorities would have to rely on self-reporting if the DSTI limit was chosen to be introduced. And country experience from Hong Kong shows that this might be a problem since households have in some cases decided not to report all of their debt (Crowe et al. 2013).

Yet, the issues related to data limitations may be alleviated in the near future, allowing for introducing the DSTI limit absent the self-reporting problems. In 2011, ECB initiated a project called AnaCredit that stands for analytical credit datasets, which will eventually result in granular data being available on individual bank loans. The collection of these data is scheduled to start in September 2018, so that the required information may be at disposal in just a few years at the time of writing. Importantly, however, at this stage of the project it remains uncertain whether private household data or only data on loans to corporations and other legal entities will be collected. (ECB 2016a) If household data will be available and it may be used by the reporting agents, essentially banks, in making their loan decisions, this would allow for significantly more reliable employment of the DSTI limit not only in Finland but in all of the euro zone.

In addition to the current limitations of the borrower-based macroprudential toolkit of the Finnish authorities, the lender-based measures in use have their own shortcomings, too. If housing market cycles are attempted to be dampened merely with capital regulation related tools, they may prove inefficient in the bust phase when the problem of pushing on a string is present. Again, this results from the fact that when firms already require higher proportion of capital than the rules would suggest, further lowering the requirements has no effect (Crowe et al. 2013). Hence, to promote countercyclicality in the bust phase of the cycle, other tools are needed.

A prominent solution to this shortcoming of capital regulation related tools can be found in developing provisioning standards so that the so-called dynamic provisioning practice is introduced. As Crowe et al. (2013) argue, despite its similar transmission channels, dynamic provisioning does not share the problem with non-binding constraints in the bust phase because it is not subject to minimums. Therefore, its use could in theory prove to be a valuable addition to the existing tools in Finland. Available empirical evidence, too, suggests that the tool generally increases resilience of the system, which promotes countercyclicality in times of financial distress (BoE 2009).

Potentiality of country-specific circumstances in the future will determine the suitability of dynamic provisioning for the Finnish system. It is especially important to ensure that international co-operation between the authorities in Finland and other relevant countries as well as at the EU level works well to keep the playing field level. Being a lender-based measure, the regulation concerning dynamic provisioning can lead to the unwanted consequence of foreign firms operating in Finland having a competitive advantage if they are not subject to similar rules. This is a particularly relevant aspect to consider in Finland now that Nordea is about to convert its subsidiary into a branch.

4.4.2 Eliminating Circumvention Possibilities

Aside from extending the toolkit of the macroprudential authorities in Finland, another potential way to promote financial stability in Finnish housing markets is to eliminate circumvention possibilities from the system in place. Of the two types of improvement propositions presented here, preventing regulatory arbitrage is probably the more multilateral and complex one. In the end, financial system regulation resembles an endless cat-and-mouse game where the authorities try to keep up with the firms circumventing the rules as best as they can. But regardless of how difficult the task of preventing regulation from leaking is, it is nonetheless crucial for achieving the policy goals.

Recent developments in Finnish housing markets appear to show some signs of circumvention of the regulation. In particular, the data on household indebtedness that is illustrated in Figure 10 provides potentially alarming insights to how households have been able to increase their leverage despite the constantly strictening rules in mortgage lending in the recent decades. This seems to have been possible by taking more debt via housing companies. Although these loans are technically held by the companies, in practice

households are responsible for a share of the debt (BoF 2016a). While household loans via housing companies were arguably negligible, say, in the 1990s, in the new millennium this type of debt has grown rapidly in terms of its proportion of annual household income and, for example, this year the proportion exceeded 15 percent (Putkuri 2016). This can be considered a relatively large figure compared to the some 80 percent households hold mortgages directly relative to their annual disposable income.

However, this is not to say that the pattern of growth in household debt via housing companies in the data is indisputable proof of regulatory arbitrage. Instead, while circumvention of regulation provides a plausible explanation for the observation, there might be other reasons behind it, too, since the phenomenon has not been extensively studied. One problem in attributing the observed developments to regulatory arbirtage is that macroprudential policy has not been conducted in its current form for long but taking debt via housing companies has increased its popularity more or less constantly for a couple of decades now. For instance, as noted, the binding regulation concerning maximum LTV ratios entered into force as late as in 2016.

On the other hand, there are reasons why households might have been increasing their leverage via housing companies even before this but to some extent still because of the strictening regulation, suggesting that they have been engaging in regulatory arbitrage. It is possible that the introduction of stricter rules was anticipated to some extent, and as the certainty regarding the upcoming regulation has increased, more and more borrowers have been taking advantage of the loophole. Also, it might be the case that the less restrictive rules already in place prior to the introduction of purely macroprudential tools in the 2010s have played some role and gradually increased housing loan costs. Thus, it could be that it has become beneficial for households to hold some of the housing-related debt they require via housing companies because of the regulation. For instance, while not very effective, the previous non-binding LTV ratio may have nonetheless caused some effect to the costs of housing loans to the households. The same is true for the household-level stress testing as well as other prudential practices banks have been conducting before the introduction of the current macroprudential framework.

Even though considerable uncertainty prevails regarding the increasing indebtedness via housing companies as a sign of regulatory arbitrage, it is likely worthwhile to consider this potential threat and attempt to address it if deemed necessary. One prominent solution candidate to the issue would be to take loans via housing companies into account in

determining the total housing loan in the LTV limit already in place. And to model the risk realistically, the part of the total loan that is taken via a housing company could be adjusted with a proper risk weight if only a proportion of it was actually an extra exposure to the household itself. This way, housing loans via housing companies could not provide a loophole in regulation through which households could increase their indebtedness regardless of the macroprudential regulation. Moreover, with the proper risk weights, if there are other reasons why taking some of the loan via housing companies is beneficial, this would not be discouraged either relative to direct mortgages.

Finally, it is in order to note that if increasing leverage via housing companies is, in fact, a circumvention possibility in the Finnish housing market regulation, it is merely one of likely many. Hence, by no means would the proposition above be a complete remedy to the complex issue. Instead, the purpose of this analysis is simply to illustrate by an example the process of identifying these types of threats along with setting out the difficulties in the task, and also to come up with a solution to the particular issue examined.

5. CONCLUSIONS

As this review shows, the system-wide stability oriented approach to financial regulation termed macroprudential policy is still an embryonic field in the broader policy framework for financial sector. Despite the growing research efforts, especially after the recent global financial crisis, there are still a multitude of gaps in our knowledge concerning the approach. Hence, in practice, macroprudential policy conducted so far has centrally involved experimentation. And as a result, various distinct regimes regarding institutional arrangements and policy tools employed have been adopted in different regions of the world.

In addition to considering the policy regimes, researchers in the field have also attempted to identify the central factors that can cause financial instability, housing markets being one of the most prominent candidates sector-wise. In part, this special interest in housing markets is naturally caused by the key role the sector played in the recent global financial crisis. But as described in detail in this analysis, there are also several fundamental rationales for the macroprudential authorities to keep a close eye on housing markets.

Most of the very same reasons for global importance apply to Finland, too, although the Finnish housing market was not distinctly shaken by the late 2000s crisis. Instead, country

experience from the house price bubble preceding the banking crisis of the early 1990s has shown in practice the relevance of housing markets in Finland. Moreover, the economy has clearly stayed prone to issues stemming from this sector also after the events that took place some 25 years ago. As illustrated in this paper by descriptive data, this is due to the characteristics of the Finnish economy that emphasize the importance of the sector even by international standards.

Given the importance, it is not surprising that, in line with the global trend, recently the macroprudential authorities in Finland have been vested with several new powers suitable for addressing problems arising from housing markets. Yet, some key limitations persist in the toolkit available, and there is definitely room for improvement. Regarding lender-based measures, for example, the recently introduced LTV cap could be complemented with the DSTI limit to further strengthen the regulation in place, as proposed. And aside from introducing new policy instruments, there is scope for developing the regulation in terms of eliminating circumvention possibilities, too.

Another central issue coming up in various different contexts in this review is international co-operation between authorities. This is likely of particular importance in Finland due to its EU membership and certain future prospects, but the same is true also beyond the perspective of a single country with globalization affecting the financial markets around the world. If problems like spillover effects of policies and cross-border regulatory arbitrage are not properly addressed, macroprudential approach cannot reach its full potential.

While the policy recommendations and the preceding literature reviewed in this paper can potentially inform decision making by macroprudential authorities or at least help identifying gaps in the existing knowledge, they nonetheless only scratch the surface. More research is urgently needed to better understand the transmission channels of different tools thoroughly. Also, providing empirical evidence regarding the effectiveness of housing market regulation is an illustrative example of subjects pertinent to further study in the field. And because ultimately the benefits should be weighed against the costs of regulation, the cost considerations, despite being largely outside the scope of this review, should be taken into account as well. Shedding new light to these issues, among others, is pivotal in forming a well-functioning and efficient regime for macroprudential regulation in Finnish housing markets as well as elsewhere.

Moreover, is worth bearing in mind that although the housing market is arguably an important factor, it is, after all, only one of many potential sources of systemic risk regarding different sectors. For instance, similar analyses as presented here for housing markets regarding other central sectors, such as the derivative market, would likely be in order to improve the macroprudential framework in Finland in a more holistic manner. Ultimately, achieving the goal of financial stability requires tools having as broad a reach as the target is.

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